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Development and Application of a Diligence-Ability Regression Model for Explaining and Predicting Competence Among Juniors and Seniors in Selected Michigan High Schools

Hinsdale Bernard
Andrews University

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Bernard, Hinsdale, Ph.D.

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U·M·I
300 N. Zeeb Rd.
Ann Arbor, MI 48106

Andrews University

School of Education

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A Dissertation

Presented in Partial Fulfillment

of the Requirements for the Degree

Doctor of Philosophy

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APPROVAL BY THE COMMITTEE:

Chair: Edward A. Streeter

Dean, School of Education

Member: Jerome D. Thayer

Member: Lawrence E. Turner, Jr.

External: Trevor G. Gardner

MAY 20 1991
Date approved

ABSTRACT

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ABSTRACT OF GRADUATE STUDENT RESEARCH

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School of Education

Title: DEVELOPMENT AND APPLICATION OF A DILIGENCE-ABILITY REGRESSION MODEL FOR EXPLAINING AND PREDICTING COMPETENCE AMONG JUNIORS AND SENIORS IN SELECTED MICHIGAN HIGH SCHOOLS

Name of researcher: Hinsdale Bernard

Name and degree of faculty chair: Edward A. Streeter, Ed.D.

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Problem

There has been growing concern that high-school students should be held more responsible for their educational results. This study aimed at developing a diligence inventory (DI) to measure the nature and extent of student involvement in their education.

The purpose of the study was to develop the DI and to formulate a multiple-regression equation to predict competence (semester GPA) from diligence and ability (ACT score). It was envisioned that this model could suggest

intervention for improved student performance through the diligence component.

Method

Two hundred and thirty-seven high-school juniors and seniors participated in the study. Item analysis and factor analysis were used in the development of the DI. Correlational and multiple linear regression analyses were employed in the development of the regression model. Analysis of variance was used to establish construct validity of the DI and to determine demographic differences in diligence among students.

Results

Diligence was defined as an expression or reflection of effort expended toward holistic development and was operationalized through five dimensions and 55 items. The five scales were: **Motivation, Concentration and Assimilation, Conformity and Responsibility, Discipline,** and **Devotedness and Spirituality.**

No significant zero-order correlation was noted between students' diligence and ability scores. A significant zero-order correlation (.54) appeared between students' ability and competence scores and between students' diligence and competence scores (.32). A significant multiple correlation coefficient (.61) resulted between competence and a linear combination of diligence and ability.

Significant main effects in diligence appeared for gender and grade. Females tended to be more diligent than males across the grades, and juniors appeared to be more diligent than seniors across genders. Of the three age groups studied, the youngest students tended to be more diligent than their older counterparts ($p < .001$). No significant difference was evident for the four socioeconomic levels studied.

Conclusions

Diligence appears to be a useful phenomenon to explain student competence as well as suggest intervention measures for improvement. Used in combination with ability, diligence can address the question of equity as far as assigning grades and interpreting performance levels are concerned. For example, situations where able students do not expend effort and perform poorly, and converse situations, may be accounted for in a diligence-ability model.

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CHAPTER I

INTRODUCTION

Background to the Problem

Introduction

School reform has been a central issue on the educational agenda over the last century, peaking in popularity soon after the publication of the U. S. National Commission on Excellence in Education report, "A Nation at Risk" in 1983. The majority of reform agendas for fostering excellence in education and effective schools, centered on the curriculum, teaching and learning, the school climate, incentives for teachers, establishing statewide mandatory testing, and administrative practices (CPRE Policy Briefs, 1989; Steller, 1988).

There was little or no emphasis on the nature and extent of student involvement with his or her education. A typical statement was:

> What can I do to get students to concentrate, to put more effort into schoolwork and to take it more seriously? This pertinent question asked by teachers daily, has been largely neglected by the educational reform movement. (Newman, 1989, p. 34)

During the decade of the 80s in particular there has been considerable concern among educators and the public that the majority of high-school students were not expending

enough effort toward their school work (Glasser, 1969; 1986; 1990).

Researchers have always been interested in identifying variables related to the teaching-learning situation that have the potential for explaining and predicting student competence. It seems logical that if students are expected to improve their academic performance during a particular quarter, semester, or school year, some kind of intervention on the part of the teachers and/or students should be necessary.

Such variables should be amenable to change by teachers and students within a relatively short period of time if they must be of value in affecting the outcome of teaching and learning in the short and ultimately the long run. This is the context in which the term intervention is used in this dissertation. Variables that relate to the quality and extent of student effort toward school work (diligence) satisfy this criterion.

Intervention Versus Non-intervention Models for Predicting Competence

Variables for the prediction of competence as measured by future GPA (FGPA) may be classified as intellective only--(for example, ability (A) and past GPA (PGPA)), non-intellective only--(for example, diligence (D), personality (P), and sociological (S) factors), or a combination of intellective and non-intellective--(for

example, different combinations of the variables in the two categories (Lavin, 1965)).

The intellective and non-intellective variables may be further classified as intervention and non-intervention in function. Figure 1 displays a grid of intervention and non-intervention models (expressed mathematically) made up

Variable type	Intervention models	Non-intervention models
Intellective variables only	1. FGPA = f(A)	4. FGPA = f(PGPA)
Non-intellective variables only	2. FGPA = f(D)	5. FGPA = f(P, S)
Intellective and non-intellective variables	3. FGPA = f(A, D)	6. FGPA=f(P, PGPA, S)

Figure 1. Models for explaining and predicting student competence

of the three classes of variables. This dissertation explored the relationship between ability (an intellective variable) and diligence (a non-intellective variable) in explaining and predicting student competence as depicted in Model 3.

The reason for classifying past GPA among the non-intervention models is the fact that it is not a changeable attribute in the same sense as ability or diligence. For example, a teacher might be interested in making projections of the distribution of grades to expect for the students in a particular chemistry class, based on their mid-term grades. If the teacher knows the average correlation between chemistry mid-term and final grades, then the projected final grades for all the students can be determined.

But intervention goes beyond projection or expectation. The teacher could advise students that if they want to get better grades they will have to make a greater effort. It must be emphasized that another variable "effort" and not PGPA must be manipulated in order to improve FGPA.

Static Versus Dynamic Predictors

In the prediction of final chemistry grades from mid-term grades, past grade (PGPA) is a static predictor; it describes the state of affairs. A static predictor is defined by a situation in which both predictor and criterion variables are the same entities--in this case it is grade or GPA. By the same argument, a dynamic predictor is defined by a situation in which predictor and criterion are different entities.

As defined in this study, dynamic and static

predictors are relative terms that are situation specific. Whether a predictor is regarded as dynamic or static depends on the criterion variable. For example, diligence when used to predict future diligence is a static predictor, but on the other hand, diligence used to predict future GPA is a dynamic predictor. Therefore, before a variable is classified as dynamic or static the criterion should be clearly specified.

A static predictor is good for predicting the criterion if conditions remain virtually unchanged; in other words such a predictor is suitable mainly for following trends. If after mid-term the chemistry students continue with business as usual, they should earn the predicted grades. Such a predictor is not very useful for purposes of intervention, but rather sets the stage for a "self-fulfilling prophecy."

It is more advisable to seek a variable (or variables) for intervention that correlates moderately well with GPA and which can be fairly easily manipulated by students themselves. As such, if diligence should have a significant and meaningful correlation with GPA, then the teacher can make a pitch to a student along these lines: "John, your diligence score last quarter was 100 and your GPA was 1.80. If you could improve your diligence score to about 150, then your GPA should climb to around 2.20." In this sense, diligence is a <u>dynamic</u> predictor. By manipulating diligence the criterion FGPA can be altered.

Model 5 can be used to describe relationships between personality and sociological factors and competence in a similar manner as PGPA. These variables have the potential to suggest intervention measures for enhancing academic performance, but such measures are usually undertaken on a wide scale over extended periods of time and are generally dictated by local district, state, or federal policies. These variables are outside the realm of student and teacher manipulation, and therefore, do not satisfy the definition of intervention as it relates to this study. Therefore, they are classified as non-intervention. Based on the foregoing arguments, model 6 is also non-intervention in function.

As defined in this study, generally speaking, static predictors are associated with non-intervention models and dynamic predictors are associated with intervention models.

The Case for Defining a Diligence Construct

Very recently a renewed emphasis has been made for a more widespread inclusion of study skills in the curriculum of elementary and secondary schools (Gall, Gall, Jacobsen, & Bullock, 1990), and the recognition that high-school students should be held more responsible for their educational results (Ericson & Ellett, 1990). The reason for this posture seems to be a response to the overwhelming research evidence that a significant and meaningful

correlation (ranging between .36 and .49) exists between study-skills scores and GPA in both high school and college (Shay, 1972).

Like study strategies, diligence as envisioned in this study, is aimed at linking academic success with student effort; but it is to be conceived as involving more than this. Diligence is intended to focus on the education of the whole person: the mental, physical, spiritual, and social dimensions (White, 1903). This is the underlying principle of holistic education.

Holistic education aims at "developing a student through a number of dimensions with a central focus on interconnecting the parts as a whole" (Singleton, Johnson, & Henning, 1984, p.10). The holistic education paradigm borrows from the medical model which avoids the piecemeal treatment of one disease at a time and, according to Gordon (1980),

> Encompasses and is at the same time indistinguishable from humanlike, behavioral and integral medicine, includes an appreciation of patients as mental and emotional, social and spiritual, as well as physical beings. It respects their capacity for healing themselves and regards them as active partners in, rather than passive recipients of, health care. (p. 3)

With this in mind, diligence may be defined as an expression or reflection of the effort expended toward the ideal of balanced or holistic development in the mental, physical, spiritual, and social dimensions. An expanded version of this definition is presented as part of the methodology in Chapter 3. It was deemed more appropriate

to operationally define diligence after the review of literature which provided a framework for its conceptualization.

Statement of the Problem

Although a number of diagnostic inventories exist about study strategies, there is a need for an instrument that could reflect the nature and extent of the effort expended by students toward holistic educational development in the mental, physical, spiritual, and social dimensions--a Diligence Inventory.

Because a growing tendency places more responsibility for educational results upon students themselves, in addition to ability, a valid and reliable measure that could explain student competence and form the basis of an intervention model must be associated with student effort. There is a need, therefore, to operationalize the construct diligence and to determine the relationship between diligence, ability, and competence.

Purpose of the Study

The purpose of the study was to define the construct diligence as it relates to holistic education and to develop and validate a Diligence Inventory (DI) for high-school juniors and seniors. The ultimate goal was to develop a regression model for predicting competence from diligence and ability. Demographic differences in diligence were also to be investigated.

Delimitations of the Study

This dissertation investigated diligence as it applies to education. This researcher considers diligence to be a state rather than a trait, thereby placing greater emphasis on practices (what students do or do not do relative to their education) over a specified period of time, as opposed to dispositions. Evidence shows that effort may be viewed as a state or a trait (Rest, Nierenberg, Werner, & Heckhausen 1973):

> The amount of effort expended by an individual may be perceived as a relatively stable disposition or trait often labeled diligence. It is reasonable to assume that students who generally try hard are labeled as diligent and are evaluated positively, while those who generally do not try hard are labeled lazy and are evaluated negatively. The amount of effort one expends on a task may also be conceived as a temporary state that can be varied from moment to moment. (p. 187)

In this study, diligence is envisioned as a measure of both quality and quantity effort, which can fluctuate in a student from time to time. It is possible for a student to be consistently making strenuous effort toward his or her education and might appear to be "diligent" by the definition proposed by Rest and others (1973), but the effort might be misdirected or of a low quality.

For example, if a mathematics student spends most of the time "diligently" memorizing formulas, that effort may not be very fruitful. But with a little coaching, this student could raise his or her level of diligence by practicing different kinds of problems that illustrate the formulas.

The success of commercial study strategy courses like "Where There Is a Will There Is an A" (Olney, 1988) is based on the assumption that students could make fairly short-term adjustments to the quality and extent of their effort to school work. The term diligence is reserved in this study to apply to these kinds of states. The notion of diligence as a stable trait does not benefit an intervention model.

This study was delimited to juniors and seniors who attended five high schools situated in five southwestern Michigan counties. Although the five counties targeted were represented, the sample was not representative of all juniors and seniors in those counties. Any generalizations made were therefore delimited to the sub-population consisting of the five participating schools.

Limitations of the Study

The time consuming clerical work associated with recording students' performance measures, namely ACT or PSAT/SAT scores, cumulative GPA, semester GPA, and subjective estimates of diligence by teachers, added to the fact that the study was conducted during the final quarter of the school year may have contributed to the relatively small number of cases in the actual study. The numbers of subjects for the two pilot studies were also relatively small.

This low response rate was the most obvious

weakness of this instrument development exercise. Eleven schools agreed to participate in the study initially. In actual fact, the five schools that returned completed responses were not representative of the target population. As such, the composition of the sample with respect to demographics was affected, and ethnic, school size, and school type (private/public) differences in diligence were not investigated, as had been planned.

Rationale

This study placed a great deal of emphasis on the need to explain competence among students during the school year so that possible intervention measures could be taken. Juniors and seniors were studied because they were considered very similar maturationally. The last two years in high school are deemed crucially important to students' plans for work or attendance at college or university.

It was believed that if a strong relationship does exist between diligence and competence, and a student's DI score could be determined early in the school year, then, hopefully, any necessary corrective measures could be taken early enough to make a difference by the end of the school year.

Since high-school GPA is known to be the strongest predictor of college success, with correlation coefficients ranging from .20 to .60 (Levin, 1965), any attempt to strengthen a student's terminal GPA could represent gains

in the right direction for college preparation. Focusing on diligence, an intervention measure which is under students' control is like addressing the root cause of a disease rather than treating the symptoms only.

Significance of the Study

Educational administrators and policy makers are constantly searching for meaningful variables to explain the performance levels of high-school graduates as well as college freshmen. There is concern that the high-school exit standards and performance levels are declining, to which the logical corollary is that the competence of college-bound students is in jeopardy.

This study could have the potential for bridging the academic gap between high school and college. If students are encouraged to be more diligent in their high-school junior and senior years in particular, this could result in fewer high-school at-risk students and a greater proportion of high-school graduates opting to enter college, in an era of a declining high-school pool from which to draw college students. Also, more diligent high-school graduates could lead to more academically capable freshmen, which could reduce the number of students enrolled in remedial courses and impact on college attrition.

If competence represented by future GPA (FGPA) is a function of diligence and ability as represented by FGPA =

f(A, D), then in this model, student competence can be explained by two factors: diligence, over which a student has very much control, and ability, over which a student has comparatively little control. This model could have implications for educational accountability. Students could be held partly responsible for the results of the educational enterprise, since they could control their diligence scores.

This researcher stresses the importance of accounting for student competence from two angles simultaneously, ability and diligence, which could offer greater insights for more meaningful interpretation of results by teachers and guidance personnel, as well as administrators and policy makers. A student's diligence score would represent the level of effort expenditure at a particular period. If the score is at a dangerous level, remedial action can be recommended.

Eisner (1937) conducted a landmark study to determine whether the degree of intelligence and industry possessed by students could be ascertained by teachers during classroom observations early in the semester. As a rationale for the study he wrote:

> Individual differences are pronounced and far reaching with respect to at least two important attributes of high school pupils: intelligence and industry. Intelligence is here referred to as the ability to learn, or to reason, or to meet a new situation. By industry is meant steady and diligent application to a task; conscientious unflagging effort. . . . If reliable and valid estimates under these two categories could be formed, they would undoubtedly be of value as

> a basis for individualized instruction and guidance. (p. 1)

Educators who are serious about educational accountability find it instructive to know, in addition to what potential a student has (ability score), how this potential is translated (diligence score) into grades or GPA (competence score).

In addition, students may be more motivated to put more quality effort into their school work if they know that perceptions of their achievement potential are not tied solely to ability or aptitude measures, but that the quality and quantity of their effort could alter the outcome of their performances in the short and long run.

Hypotheses to Be Tested

The following hypotheses were tested for high-school juniors and seniors as a combined group. Hypothesis #1 related to testing the DI for construct validity.

1. There is a significant difference in diligence (as measured by the DI) between the three groups of students that teachers subjectively classify as having low, average, and high diligence.
2. There is a significant correlation between students' diligence and ability scores.
3. There is a significant correlation between students' ability and competence scores.
4. There is a significant correlation between students' diligence and competence scores.

5. There is a significant multiple correlation between competence and a linear combination of diligence and ability.
6. There is a significant multiple correlation between competence and a linear combination of the scales of diligence and ability.
7. There are significant gender and grade main effects in diligence among high-school students.
8. There is significant gender by grade interaction in diligence among high-school students.
9. There is a significant difference in diligence between the students in the three age groups defined in this study.
10. There is a significant difference in diligence between students in the four socioeconomic levels defined in this study.

Definition of Terms

The following terms are defined in the context in which they were used in this dissertation.

Ability: a measure of student's potential performance level as indicated by the score on the ACT, PSAT, or SAT.

Achievement: long-term level of performance as measured by grade-point average (for example, cumulative GPA).

Competence: short-term level of performance as measured by grade-point average (for example semester GPA).

Grade-point average: a measure of a student's academic performance, figured on a scale A = 4.00 and F = 0.00.

Junior: a high-school student in the 11th grade.

Senior: a high-school student in the 12th grade.

Organization of the Study

This study is organized into six chapters. Chapter 1 presents a background to the problem, the problem, and purpose of the study. The main delimitations and limitations are explained. A rationale for and significance of the study are outlined, followed by the research hypotheses and definitions of terms used in the dissertation.

Chapter 2 is a review of literature intended to highlight the progress of educational reform over the last three decades and identify some variables and a philosophical foundation for operationalizing diligence.

Chapter 3 presents the methodology of the study including an operational definition of diligence. The procedures for the development and validation of the DI are outlined. Included also are the descriptions of the population and sample, the statement of the hypotheses, and statistical techniques used in analyzing the data.

In chapter 4 the results of the data analysis are

presented with regard to the instrument development phase of the study.

Chapter 5 is devoted to the findings with respect to testing the hypotheses and, specifically, the development of a multiple-regression model for predicting or explaining competence from diligence and ability.

Chapter 6 summarizes the study, draws relevant conclusions, and presents a discussion of the findings. Some recommendations for further research and development, as well as some applications of the DI are forwarded.

The appendix includes all the supporting documents, letters, and various phases in the development of the instrument.

CHAPTER II

REVIEW OF LITERATURE

Introduction

This literature review is aimed at (1) establishing context and rationale for the dissertation and (2) providing a basis for operationalizing the construct diligence. In order to address the first objective, the progress of educational reform was reviewed, with special emphasis on the decades of the 60s, 70s, and 80s. Educational reform in that period led to greater attention to issues of accountability, the development of minimum competency testing, the effective schools and excellence in education movements.

To assist in the operationalization of the construct diligence and the eventual development of the diligence inventory, some models for predicting competence were reviewed, and the profile of the high-school dropout was examined. In this study diligence was equivalent to the extent of quality effort. Both attribution theory (modified by Madeline Hunter) and Glasser's Control Theory have emphasized the importance of effort to academic performance. These theories were reviewed against the

backdrop of the effort-ability debate with respect to academic performance.

It was important to provide a philosophical foundation for conceptualizing diligence, without necessarily becoming side tracked into reviewing the myriad of educational philosophies that exist.

The Progress of Reform: 1960-1990

Historical Background

Before outlining the reform agendas of the last three decades, a brief review of the early foundations is presented. The tradition of high-school reform began in the United States in the late 19th century (James & Tyack, 1983). In 1893, the Committee of Ten prepared a report aimed at bringing some organization to the high-school curriculum in order to improve the standard of preparation for college.

In 1918 another group of reformers wrote a position paper on the high school titled Cardinal Principles of Secondary Education, focusing on six key objectives of secondary education:

1. preparing the young for health
2. worthy home membership
3. vocation
4. citizenship
5. worthy use of leisure time
6. ethical character (James & Tyack, 1983, p. 403).

The next wave of reform came in the depression years of the 1930s. This was a period of re-examination of the historic functions of public schools in order to offer an interpretation for the crisis that existed at that time.

The 1950s represented a period of great awakening in education. Attacks were levelled at what was considered watered-down curricula, declining standards of academic performance, and incompetent teaching and administration. Major curriculum reform efforts were catalyzed by the launching of the Russian Sputnik I in 1957. The passage of Public Law 85-864, the National Defense Education Act in 1958, led to innovative curricular improvements particularly, in science, mathematics, and social studies.

The Accountability Movement

The accountability movement gained momentum after the launching of Sputnik I in 1957. For the first time educators were held accountable and were found wanting (Sullivan, 1973). During the decade of the 1960s, the emphasis in educational accountability was on inputs (for example, curricula, teaching, facilities, finance, etc.). By 1970 the Gallup Poll (Gallup, 1970) showed that 70 % of the public believed that teachers and school administrators should be held more accountable for student performance. Hence, during the 1970s, the emphasis shifted from inputs to outputs or results.

Several definitions and viewpoints of accountability emerged during that period. Mayrhofer (1973) defined accountability as the result of reporting student accomplishment to the public and accepting the consequences of that accomplishment. Mortimer (1973) focussed on educational effectiveness and efficiency. Alkin (1973) defined three types of accountability--goal, program, and outcome accountability.

This review emphasized the aspect of accountability that related to results or performance standards achieved by students--outcome accountability. Lessinger and Tyler (1971) expressed the mood of the time thus:

> Some assert that schools are supported as a service to the public and the public has the right to demand an accounting. Which children are learning and which are not? What are they learning? How much are they learning? It is an obligation for boards of education and legislators to obtain and make public the results of systematic, unbiased, reliable appraisals of the results being attained by schools. (p. 3)

Another issue raised by Lessinger and Tyler (1971) was the means by which the attainment of these goals was to be measured. They argued that the traditional method of standardized testing should be replaced by criterion-referenced testing, due to the many limitations inherent in the former.

If teachers were to be held more accountable for students' performance, Dyer (1972) believed that they should be evaluated on variables that were relatively easy to measure. Four groups of variables were identified for

the development of acceptable criteria for staff accountability: input, educational process, surrounding conditions, and output. Dyer singled out surrounding conditions as being able to positively or negatively affect how teachers teach and students learn.

Surrounding conditions consisted of home conditions, community conditions, and school conditions. The identification of hard-to-change as opposed to easy-to-change conditions was deemed crucial in working toward objective criteria for professional accountability. In response to this need, Dyer (1972) developed the concept of School Effectiveness Indices (SEIs) which were designed to correlate the efforts of teachers in producing changes in students' development after making allowance for those variables over which teachers had no control. Dyer's point was that accountability should not be tied solely to students' standardized test scores but should take into consideration other non-intellectual factors over which teachers and students had control.

The emphasis in this dissertation is on factors over which the students themselves have control--their diligence or extent of engagement with their education. Sedlak and others (1986) reviewed the literature on the extent of engagement to school work demonstrated by high-school students during the first eight decades of the 20th century. They concluded that a vast majority of students believe that there is no need to concentrate on the

acquisition of knowledge in high schools--a condition that existed since World War I.

Furthermore, the combination of civil rights issues with curricular reform during the 60s and 70s may have served to heighten student disengagement evidenced by declining ACT and SAT scores. Ericson and Ellett made the point that

> [T]he preeminent concerns about social justice and equal educational opportunity in the last few decades have indeed drawn attention away from students, their activities and their potential responsibilities in school. (p. 4)

The present trend, however, is to redirect the focus back to the students.

Student Responsibility for Learning

During the 80s questions were raised as to who was responsible for the learning of students--the student, the teacher, or both. Ericson and Ellett (1990) compared two recent approaches for attributing the ultimate responsibility for learning to the student.

One approach was based on the causal relationship between teaching and learning advanced by Fenstermacher (1986). He believed that because students' activities and not teachers' activities directly cause student learning, students are responsible for their own learning.

Ericson and Ellett pointed out the pitfalls in Fenstermacher's arguments and concluded that there is no direct cause-and-effect relationship between teaching and

learning, but that there are interactions in the teaching-learning situation. They emphasized that learning is jointly caused by the teacher and the student.

The second approach reviewed was a general normative analysis of teaching and learning by Shulman (1987), who believed that in a democratic society teaching practice may not always match the normative ends of society; students should know the difference and be responsible for their own learning. One of the problems about this approach was that it overgeneralized students' responsibility for learning.

Ericson and Ellett went on to show that in a united, reformed, liberal democracy it is possible for a student to have both a right to an education and a responsibility in obtaining that education, because in general, with rights come responsibilities to act in a certain manner.

Minimum Competency Testing

The quest for accountability for student results led to the development of minimum competency testing (MCT) in most states and a re-examination of testing practices in general. There emerged a growing trend toward a shift from holding teachers and administrators mainly responsible for students' performance to placing much more responsibility with students themselves--the diligence factor.

Coming on the heels of the innovative curriculum

reforms of the 1960s was the call for equity in education. The 1960s and 1970s was a period of unprecedented changes in the society, in general, and in education, in particular. Blacks, Hispanics, women, the handicapped, and other groups that were not being adequately represented on educational policy matters began to demand a say in helping to shape the schools (James & Tyack, 1983). This agitation resulted in a nationwide study that produced the report Equality of Educational Opportunity (Coleman et al., 1966).

Minimum competency testing was one of the reform replies to the Coleman Report. As a reaction to the public's demand for better accountability, MCT began in the mid-1970s. In 1976, a joint task force of the National Association of Secondary School Principals and the US Office of Education called for the adoption of competence requirements in communication skills, mathematics, and American history as a condition for receiving a high-school diploma. Two types of reform activities were the focus of attention during the late 70s:

1. high school students were required to pass a minimum competency test prior to graduation
2. average scores of groups on standardized tests were used as evidence of the quality of individual schools and of the system as a whole. (Salagnik, 1985)

By the early 1980s MCT gained nationwide political acceptance and the integration of minority groups into the mainstream of society was seen as the most visible force behind the MCT movement (Ross, 1982).

Brittell (1980) pointed out that a distinction should be made between competence and excellence. Whereas competence was tied to equity, excellence was associated with the upper limits of a school's potential. Competence came to be associated with the need to satisfy the various publics that minority groups were achieving success at least to a preassigned minimum standard. This was a political move intended to demonstrate that the states were serious about their responsibility for providing universal education. But competence was not necessarily to be equated with excellence.

Cohen and Haney (1980) observed that while MCT left it to the state to set the minimum standards, the burden of satisfying the minimum was shifted from the state to the individual--a shift that is fundamental to the rationale behind the development of a diligence inventory.

The National Commission on Excellence in Education concluded that "minimum competency" examinations fell short of what was needed and that the minimums tended to become the maximums, thus lowering the standard for all students (Madaus, 1985).

According to Rieggle (1980) and Cunningham (1986), the future of MCT rested with the ability of test and measurement specialists to construct tests that are appropriate for all groups represented in the school system. It is possible that MCT might eventually fade in the tide of testing reforms. However, the 20th Annual

Gallup Poll (Gallup & Elam, 1988) reported that 73% of those polled favored a national examination for high-school graduation. Furthermore, 81% of the respondents favored national tests for comparing schools. It seems evident that standardized testing will continue to be an important facet of educational accountability.

Standardized Testing

The use of norm-referenced testing dramatically increased in US schools in the 1920s and 1930s as a result of the popularization of intelligence testing, and the Army Alpha and Army Beta tests during World War I. The next big leap in the use of testing in schools occurred during the 1950s and 1960s in response to the National Defense Education Act of 1958 and the Elementary and Secondary Education Act of 1965 that promoted testing (Haney & Madaus, 1989).

It is estimated that the volume of testing in schools has been increasing by between 10% and 20% annually over the past 40 years. Testing received a substantial boost in the 1980s from a number of initiatives that focused on educational reform (Haney & Madaus, 1989).

In a study conducted by the National Center for Fair and Open Testing, it was estimated that US public schools administered 105 million standardized tests to 39.8 million students during the 1986-1987 school year (Neill & Medina, 1989). Put another way, each year an estimated 20

million school days and $700 to $900 million are devoted to taking standardized tests (Rothman, 1990). These statistics have caused educational reformers and policy makers to carefully re-examine the economic returns of standardized testing in the light of the ongoing debate over this issue.

There are very strong arguments for and against standardized testing. On the positive side:

- Test results provide a way for the public to monitor educational standards over time. Test results also help teachers and school officials to identify weakness in instruction and curriculum.
- Tests provide the data that enables others to keep the pressure on communities, schools, and educators to close the gap between the performance of black students and that of whites--a pressure that is finally bringing results.
- Test results dramatically document two facts: (1) that Federal programs such as Head Start and Title I of the Elementary and Secondary Education Act have very positive long-term effects and (2) that poor children can and will learn, when given the help and kind of instruction they need. (Anrig, 1985, p. 624)

On the negative side:

- Because the public attaches great weight to standardized tests like the SAT or ACT, and the scores usually have serious consequences, teachers tend to teach to the test.
- Instruction in the format of multiple choice items has other far-reaching negative consequences--it leads to endless drill and practice on decontextualized skills. (Shepard, 1989, p. 5)

Howe (1985) cautioned about the pitfalls in interpreting standardized test scores. It was pointed out that a good part of the decline in SAT scores during the 60s and 70s resulted from the inclusion in the test taking

pool of new groups. As a result, declining test scores were sometimes mistakenly interpreted to mean declining quality, when in fact the inclusion of minority groups represented a positive step toward addressing the question of equity.

Howe (1985) also argued that the SAT is not a good instrument for measuring school quality or school effects, and that most high-school students do not take the test anyway. The same applies to the ACT. Usually college-bound students are the ones who opt to take these tests, but inferences are made about the entire high-school population which gives an inaccurate picture of the overall level of student performance. Based on this observation, the picture might be even worse than what is reported if the students who do not take these tests are in the majority and happen to be less able as well.

There is reason to believe that the use of standardized testing will increase rather than decrease in the future. Bell (1988) stressed the need for a nationwide system of assessment that should cover every school district and every school in the United States, as well as state-by-state rankings of school districts. In response, the governing board of the National Assessment of Education Progress has unanimously approved a plan to set the first national standards for student achievement. The plan began in fall 1990 with assessment in mathematics, with the hope of expansion to all areas by 1992, should the initial

phase be successful. This is the first plan to provide state-level data on performance (Rothman, 1990).

There is a solid case for the use of standardized testing to enhance the decision-making process in schools. Thayer's (1984) summary of the rationale and role of testing will be relevant well into the future of testing reforms:

> Teachers and administrators need to make important decisions regarding individual students, classrooms and schools. These decisions should be made on the best available information. Standardized tests provide information that can be used along with other facts to aid in making many of these decisions.... Standardized tests should seldom, if ever be used as the sole basis for an important decision about a student's abilities. (p. 14)

The present status of reform in testing seems to suggest the need for other measures to go along with the well-established standardized tests of ability in an attempt to address issues of fairness in the assessment of students. The diligence inventory purports to be one response to this need. The DI is intended to address issues of equity since it will factor in the student's extent of effort or involvement with his or her education.

Education Reform Initiatives of the 1980s

The National Commission on Excellence in Education Report, A Nation at Risk (1983), catalyzed most of the reform agendas for the 1980s. The part of the report that stimulated the activity was as follows:

- American students do not fare well in international

comparisons on academic tests.

- the average achievement of high school students on standardized tests was lower than it was two decades earlier.
- gifted students were not performing commensurate with their ability
- 40 percent of minority students were functionally illiterate
- American SAT scores had fallen between 1963 and 1980
- only one fifth of 17 year olds could write a persuasive essay
- science achievement scores steadily declined between 1969, 1973, and 1977
- one fourth of all mathematics courses taught in four-year colleges are remedial in nature.
- both business and military are spending millions of dollars annually on training programs in basic skills. (p. 7, 8)

Furtrell (1989) identified four waves of reform during the 1980s. The first wave consisted of top down reform from the statehouse. It is reported that between 1983 and 1985 more than 700 statutes were enacted to specify who should teach what to whom, when, and how.

Second-wave reform was a reaction to first wave-reform. It was based on the premise that if education were to serve as an instrument for social and economic revitalization, then educators and not legislators should be at the forefront. Second-wave reform, therefore, relied on the collaborative efforts of teachers, principals, superintendents, school boards, parents, and community leaders to improve the schools. During that period equal consideration was given to equity and excellence in education.

The third wave of reform focused on the U.S. economy. The emphasis shifted to the utilitarian functions

of education. There was a need for graduates who could assert the nation's economic preeminence. On the other hand, fourth-wave reform seemed to integrate second- and third-wave objectives. According to Furtrell:

> Fourth wave has as its focus an education that prepares tomorrow's adults to meet ethical as well as economic imperatives--that prepares them not only for a life of work but a life of worth. Fourth wave reform is predicated on the assumption that schools must offer both excellence and equity. It envisions schools that will enable every student--regardless of race, sex or socioeconomic status to reach his or her full potential. Fourth wave reform must help America meet its economic imperatives and its moral obligations. (Furtrell, 1989, p. 13)

In an effort to determine how the states were responding to the different reform agendas, the Center for Policy Research in Education examined reform measures in six representative states--Arizona, California, Florida, Georgia, Minnesota, and Pennsylvania (Firestone, Fuhrman, & Kirst, 1989). Based on reform activities in the six states, it was found that the highest level of activity was in mandating more academic courses and making changes in teacher certification.

It was noted that every state joined in a national movement to address concerns expressed in the 1983 report, A Nation at Risk. Mandatory state-wide testing was introduced for the first time in some states. A proposal was made in 37 states to increase the number of days in the school year. However, only 9 of the 37 states followed through with the proposal and one of the 9 states pushed the number of days beyond 180. As for incentives,

teachers' salaries increased 22% in real terms between 1980 and 1988.

Throughout that period, equity concerns were overshadowed by the emphasis on high standards. The Effective Schools and the Excellence in Education movements gained momentum during that period of reform (Howe, 1987; Honig, 1985; Purkey & Smith, 1985; Timar & Kirp, 1988). Excellence was seen as the primary goal of educational reform.

When the governors had their first conference on educational reform in 1986, they raised seven "tough questions" in order to stimulate the agenda for reform activities.

- Why not pay teachers more for teaching well?
- What can be done to attract, train and reward excellent school leaders?
- Why not let parents choose the schools their children attend?
- Aren't there ways to help poor children with weak preparation succeed in school?
- Why are expensive school buildings closed half the year when children are behind in their studies and many classrooms are overcrowded?
- Why shouldn't schools use the newest technologies for learning?
- How much are college students really learning? (Alexander, 1986, p. 202)

Historically, the extent of implementation of reform initiatives has been meager. A recent review of a century of national commission reports on education suggests that at best, change "trickles down" to schools (Firestone, Fuhrman, & Kirst, 1989). Despite this fact, policy makers feel impelled to come up with new objectives,

sometimes before the old ones are disseminated. The governors met again in 1990 to formulate objectives for the next decade, based on the goals enunciated by President Bush in January 1990. The six goals and the objectives that are relevant to this study are as follows:

Readiness

Goal 1. By the year 2,000 all children will start school ready to learn.

Goal 2. By the year 2,000 the high school graduation rate will increase to at least 90 percent.
Objectives:

- The nation must dramatically reduce its dropout rate and 75 percent of those students who drop out will successfully complete a high school degree or its equivalent.
- The gap in high school graduates between American students from minority background and their non-minority counterparts will be eliminated.

Student Achievement and Citizenship

Goal 3. By the year 2000, American students will leave grades 4, 8, and 12 having demonstrated competency in challenging subject matter including English, mathematics, science, history, and geography, and every school in America will ensure that all students learn to use their minds well, so they may be prepared for responsible citizenship, further learning and productive employment in our modern economy.
Objectives:

- The academic performance of elementary and secondary students will increase significantly in every quartile, and the distribution of minority students in each level will more closely reflect the student population as a whole.
- The percentage of students who demonstrate the ability to reason, solve problems, apply knowledge, and write and communicate effectively will increase substantially.
- All students will be involved in activities that promote and demonstrate good citizenship, community service, and personal responsibility.

- The percentage of students who are competent in more than one language will substantially increase.
- All students will be knowledgeable about the cultural diversity of this nation and about the world community.

Mathematics and Science

Goal 4. By the year 2000, US students will be first in the world in mathematics and science achievement.

Adult Literacy and Lifelong Learning

Goal 5. By the year 2000, every adult American will be literate and will possess the skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship.

Safe, Disciplined and Drug-free Schools

Goal 6. By the year 2000, every school in America will be free of drugs and violence and will offer a disciplined environment conducive to learning. (Education Week, 1990, p. 16 ,17)

Educational reform has come a long way from the Cardinal Principles of 1918. However, there seems to be some degree of similarity between the goals enunciated at the beginning of the century and the goals for the last decade of the century. The main idea is that the best is desired for students and they are expected to perform to the best of their abilities, not only academically but socially as well.

President Bush (1988) emphasized this point when he quoted Martin Luther King: "We must remember that intelligence is not enough. Intelligence plus character--

that is the goal of education." President Bush went on to assert:

> We must emphasize the importance of family, work and education. . . . We need to encourage teachers and parents to demand more of American children . . . both as scholars and as citizens. Homework pays. We cannot succeed if a child spends seven to eight minutes a day reading silently in class and 120 minutes watching TV at home. (Bush, 1988, p. 118)

Clearly, the agenda is in place for students to be the focus of reform initiatives. Students will be called upon to invest more quality effort in their education if these ambitious goals are to be realized. A sound accountability system must not only monitor student performance through some form of testing but also the extent of the effort related to that performance. The diligence inventory is intended to quantify student effort.

Effort Versus Ability in Explaining Competence

Attribution theory developed by Heider (1944) and later modified by Frieze (1976), and Weiner (1979) was simplified by Madeline Hunter for direct application in the classroom setting (Hunter & Barker, 1987). According to this simplified version of attribution theory, success and failure are attributed to four factors: native ability, effort, luck, and task difficulty. Native ability and effort are considered to be the most dominant factors. These four attributions exist on three continuums: locus, stability, and controllability.

Locus can be internal (me) or external (not me).

Native ability and effort are internally rooted, whereas task difficulty and luck are externally rooted. Students' expectations for the future are based on whether the cause is stable or unstable. Effort and luck are regarded as being unstable, and native ability and task difficulty as stable causes of success or failure.

Controllability relates to a student's sense of power to affect the outcome by controlling the cause. Hunter and Barker (1987) emphasized that

> Of all the causal attributions, the only one completely under our control is effort. We can determine how much effort we will expend. . . . [I]f students are to succeed they must believe that when they expend effort--something they can completely control--they will experience success. (p. 51)

Glasser (1986) explained the causes of success and failure through Control Theory which, like Attribution Theory, places a great deal of emphasis on the importance of effort to success. Glasser posited that "all our behavior, simple to complex is our best attempt to control ourselves to satisfy our needs. . . . It is how well I study that determines success" (p. 17).

Glasser (1986) described a good school as "a place where almost all students believe that if they do some work, they will be able to satisfy their needs long enough so as to make sense and keep on working." Furthermore Glasser (1969, 1989) believed that the quality school is characterized not only by students doing some work, but by the fact that a substantial majority actually do high-

quality work when he wrote:

> The students are the workers of the schools. And like most service industries, the difference between success and failure of the organization depends on the quality of their work, be it waiting on tables or learning academic subjects. All the measures of school failure that are widely reported--such as dropout rates, low tests scores and student's unwillingness to take "hard subjects" (for example math, science, etc.) are the result of students failing to expend the effort to do quality work. (Glasser,1990, p. 427)

The diligence proposed in this study is consistent with the type of effort described by Hunter and Glasser.

Models for Predicting Competence

Introduction

Walberg, Schiller, and Haertel (1979) reported on six variables that are constantly related to educational outcomes, and the approximate amounts of partly overlapping variance in cognitive learning they predict.

- Motivation -- 11%
- Ability -- 60%
- Time or quantity of instruction -- 20%
- Intensity or quality of instruction -- 20%
- The social-psychological climate of the classroom group -- 60%
- The educational stimulation of child by parents at home -- 20% (p. 180)

This dissertation focused on non-intellective variables that were directly under the student's control and were relatively easy to manipulate for intervention purposes. Specifically, these variables should measure student practices and, to a lesser extent, attitudes with respect to school work, as opposed to perceptions or interests.

Studies that satisfied these criteria were given greater attention in this review. Such studies centered around study strategies, motivation, attribution theory, television viewing, time and learning, and homework. The limited number of studies on diligence were reviewed, although, in most cases, the objectives of these investigations were tangential to the focus of this dissertation.

It must be emphasized that of the two attributes under investigation, ability tends to be more stable in the sense that it is not potentially changeable within an individual in the short run. Hence, the review in this area was limited to the establishment of the correlation coefficient between ability and achievement.

Studies in which high-school ability measures were used to predict high-school achievement yielded correlations ranging from .40 to .60 (Keith, 1982; Keith et al., 1986; Lavin, 1965). However, Thorndike (1961) cautioned that there are still many marked discrepancies between intelligence test scores and what a particular child does in school. Jencks and Crounse (1982) suggested that tests used in college admission should be designed to reward diligence and seriousness during the high-school years, a characteristic they observed is not possessed by the SAT and similar tests of ability or aptitude.

Study Strategies

Gall and others (1990) defined study skills as the effective use of appropriate techniques for completing a learning task. They also made the distinction between different terminologies associated with studying. A "study technique" is a particular procedure used to perform a learning task but a "study skill" is the ability to use this technique appropriately and efficiently. A study skill differs form a "study strategy" in that the latter refers to the total study process. "Study attitudes " and "study motivation" refer to students' desire to use particular techniques rather than the skill in using the techniques effectively.

A typical study strategy inventory consists of items that are associated with scales that reflect the following qualities in students:

1. Self Evaluation
2 Organizing and Transforming
3. Goal Setting and Planning
4. Seeking Information
5. Keeping Records and Monitoring
6. Environmental Structuring
7. Self-Consequences
8. Rehearsing and Memorizing
9. Asking Peers for Help
10. Asking Teachers for Help
11. Asking Adults for Help

12. Reviewing Tests
13. Reviewing Textbooks
14. Systematically Reviewing All Materials to Prepare for Special Projects or Tests (Zimmerman & Pons, p. 198).

Several commercial instruments on study skills or strategies for high-school and college students are available, for example: the Survey of Study Habits and Attitudes (SSHA) by Brown and Holtzman (1967), the Learning and Study Strategies Inventory (LASSI) by Weinstein, Schulte, and Palmer (1987), the Minnesota Study Habits Blank: Self Analysis Form (Raygor, 1980), the Effective Study Test (Brown, 1964), and the College Adjustment and Study Skills Inventory (Christensen, 1968).

A review of such inventories by Schulte and Weinstein (1981) and reported by Weinstein, Goetz, and Alexander (1988) indicated that most of the inventories cover traditional areas of study skills such as note taking, time management, work habits, and student attitudes toward school and study. The reliability reported for these instruments are generally in the range of .80 and above, whereas the reliability of the subscales which are naturally shorter in length range from as low as .46 to as high as .93.

The correlation coefficient between scores on these inventories and GPA range from .20 to .60 and in rare cases above. An example is the Survey of Study Habits and Attitudes (SSHA) form H which was standardized on 11,218

students in grades 7-12 (Holtzman & Brown, 1968). The instrument consists of four subscales containing 25 items each: Delay Avoidance, Work Methods, Teacher Approval, and Education Acceptance. The first two scales form the Study Habits dimension and the last two form the Study Attribute dimension. The four scales combine to form the Study Orientation score. Correlations between GPA and the Study Orientation scores ranged from .32 to .66, with an average of .49 (Holtzman & Brown, 1968).

Motivation and Attribution Theory

This study did not attempt to review the literature on motivation per se, but made reference to a few motivational and attributional studies. Brophy (1987) distinguished between the trait of motivation and the state of motivation. Here motivation as a trait is considered to be a disposition, and motivation as a state reflects student engagement or activity. According to Brophy (1987):

> Whereas the trait of motivation to learn is an enduring disposition to strive for content knowledge and skill mastery in learning situations, the state of motivation to learn exists when student engagement in a particular activity is guided by the intention of acquiring the knowledge or mastery of the skill the activity is designed to teach. (p. 40)

The self-worth theory of achievement motivation (Covington, 1984) is based on perceptions of one's ability and effort. The main elements of the self-worth model are presented in figure 2.

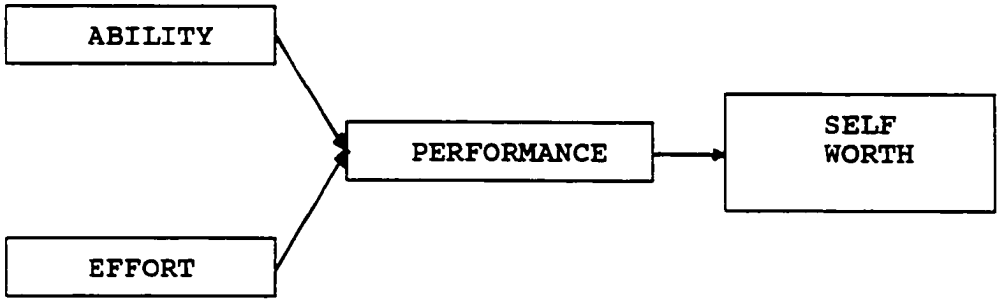


Figure 2: Self-worth model of achievement motivation (Source: Covington 1984, p.8).

In this model it is assumed that several factors influence one's sense of worth and adequacy, including performance level, self-estimate of ability, and degree of effort expenditure. The arrows indicate causation. This study is concerned with the first three elements of the model and stops short of explaining self-worth, which is not relevant to the study.

Several studies deal with the affective consequences of attributing success or failure to students' self-perceptions of effort and ability (for example, Andrews & Debus, 1978; Brown & Weiner, 1984; Covington, Spratt, & Omelich, 1980; Jagacinski & Nicholls, 1984; Nicholls, 1976; Rest, Nierenberg, Weiner, & Heckhausen, 1973; Schunk, 1982; Weiner & Kukla, 1970).

These studies examined whether students attribute success or failure to ability or effort. The self-perceptions of students had implications for their feelings of self-worth or shame. It was reported that generally

elementary-school children associate success with effort, whereas high-school students tend to associate success with ability. High-school students show a tendency to reduce effort when there is a high risk of failure, because the combination of failure and greater effort expenditure leads to shame. Nicholls (1976) found that the extent of student satisfaction with success is associated with ability ($r = .33$), effort ($r = .15$), and task difficulty ($r = -.44$) ascriptions.

In comparing American and Japanese high-school students, Holloway (1988) noted that emphasis by American teachers on the importance of effort did not convince their students that effort was the most important determinant of achievement. In contrast, performance was viewed as hinging on effort rather than ability in Japan (Holloway, 1988; Shimahara, 1985).

In a study in which high-school algebra achievement was predicted using attributional, motivational, and achievement measures (Tepper & Powers, 1984), a sample of 110 students (56 males and 54 females) enrolled in grades 9 through 12 in a large urban school district were administered the Multidimensional-Multiattributional Causality Scale (MMCS) (Lefcourt, Van Baeyer, Ware, & Cox, 1979). The MMCS consists of a 24-item scale developed to assess achievement locus of control. The responses were rated on a scale from 0 (disagree) through 4 (agree). The

items were divided evenly between experiences of success and failure.

Eight 3-item subscales were designed to measure (1) attribution of success to ability or of failure to ability, (2) attribution of success to effort or of failure to effort, (3) attribution of success to context or of failure to context, and (4) attribution of success to luck or of failure to luck.

The California Achievement Test was administered to provide achievement scores for the subjects. High-school algebra grades constituted the criterion measure. The results showed that the zero-order correlation between algebra grades and the other variables indicated that achievement motivation was most highly correlated with algebra grades ($r = .39$, $p < .05$). Luck was negatively correlated with algebra grades ($r = -.23$, $p < .05$). Although attributions of success to effort was expected to be a significant predictor of achievement, this study did not support this contention ($r = .01$). The same was true for ability ($r = -.01$).

Homework

In a review of 120 studies on homework's effects, Cooper (1989) reported swings in the public's attitude toward homework. It was found that the positive effects of homework seemed to outweigh the negative effects.

Positive effects of homework

1. Immediate achievement and learning
   - Better retention of factual knowledge
   - Increased understanding
   - Better critical thinking, concept formation, information processing
   - Curriculum enrichment.

2. Long term academic effects
   - Willingness to learn during leisure time
   - Improved attitude toward school
   - Better study habits and skills

3. Non-academic affects
   - Greater self-direction
   - Greater self-discipline
   - Better time organization
   - More inquisitiveness
   - More independent problem solving

4. Greater parental appreciation and involvement in school.

Some negative effects of homework reported were:

1. Satiation
   - Loss of interest in academic material
   - Physical and emotional fatigue

2. Denial of access to leisure-time and community activities

3. Parental interference
   - Pressure to complete assignments and perform well
   - Confusion of instructional techniques

4. Cheating
   - Copying from other students
   - Help beyond tutoring

5. Increased differences between high and low achievers. (Cooper, 1989, p. 86)

Keith (1982) found that time spent on homework had a positive effect on a student's grades in high school. The moderate zero-order correlation (.320) between time spent studying and grades was reduced to a smaller but

still highly significant coefficient (.192) when race, background and ability, and field of study were controlled.

Television Viewing

In a path analytic study to determine the effects of parental involvement, homework, and TV time on high-school achievement (Keith et al., 1986), it was reported that children of low ability who belong to the low socioeconomic status watch more TV, on the average, than do their more able peers.

In an effort to integrate empirical findings concerning the impact of leisure time viewing on student achievement in grades K-12, 274 correlations from numerous sources were averaged (Williams et al., 1982). The overall correlation of hours of televiewing and achievement was found to be negative but small (-.05).

Time and Learning

Many of the studies that investigated the relationship of time on task to academic achievement were based on Carroll's (1963) model of school learning. According to this model, learning is regarded as a function of two quantities: the amount of time a learner actually spends on the learning task and the total amount of time that is needed to learn the task.

A number of models are based on Carroll's (1963) original model (see Borg, 1980). Gettinger and White (1987) reported that time taken to learn was a stronger

correlate of school achievement (r = .85 to .87) than IQ (r = .59 - .76) for two samples of sixth graders. Two other related studies conducted by Gettinger (1984, 1989) yielded similar correlations between time taken to learn and achievement.

Wiley (1973) cited in Borg (1980) analyzed Coleman's (1966) data and predicted that increasing the number of days in the school year by 5.5% would lead to achievement increases ranging from 8.33 to 16.42%; increasing the hours of the day from 5 to 5.5 or 5.5 to 6 would yield substantial percentage increases in achievement measures. Also increasing the attendance from 88 to 95% would produce gains ranging from 11.75 to 23% on achievement variables.

Research evidence over the past four decades have shown a consistent positive relationship between time on task and achievement. However, this dissertation is concerned with both quality time and quantity time. It seems reasonable to infer that high quality effort spent in educational pursuits requires some sustained attention. The converse may not be true, increasing the amount of time spent on a task may not necessarily be reflective of the quality of effort. There comes a point of diminishing returns.

Studies on Diligence

A paucity of studies deal with diligence as envisioned in this dissertation. In a study conducted by Hatano and Inagaki (1982), 64 reflective and 58 impulsive fifth-graders classified by the Kagan's Matching Familiar Figures Test (MFFT) were presented four fictitious models in a questionnaire--Reflective, Fast-Accurate, Impulsive, and Slow-Inaccurate in that order. The performances of these fictitious models on the MFFT were described verbally (e.g., "The child took longer than usual but made fewer errors"), as well as numerically. The students were asked to rate the four fictitious models on brightness and diligence on a scale of 1 - 5.

Definitions of brightness and diligence were not reported in the article, but in the context used they appear to relate to ability and diligence, respectively, as envisioned in this dissertation.

The results indicated that reflective and impulsive children differed significantly in two of eight ratings (one for each of four models on brightness and diligence, respectively). The reflective children considered Fast-Accurate to be brighter and Slow-Inaccurate to be more diligent than the impulsive children. The time taken being equal, models with fewer errors than with more errors on the MFFT were rated brighter and more diligent by both reflective and impulsive children (implying some degree of correlation between brightness and diligence).

Covington and others (1980) conducted a study to determine whether the student with a history of steady diligent effort is evaluated differently by teachers than the student who is characterized by erratic bursts of energy and periods of indifference to study.

Although diligence was not explicitly defined in this study, the distinction was made between effort stability and effort level or sheer quantity of effort. Effort stability or patterns of effort was the equivalent of "diligence" as perceived in that study. The title of the study also suggests this distinction: "Is Effort Enough, or Does Diligence Count Too? Student and Teacher Reactions to Effort Stability in Failure." Here "effort" really refers to quantity of effort and "diligence" quality of effort, in the sense of consistency of that effort. In contrast quality of effort in this dissertation refers to the "kind" of effort.

The results indicated that effort stability or diligence made little contribution to how students felt about their failure. However, the level of diligence demonstrated by students influenced teachers' judgments about their academic potentials.

In a study that investigated the influence of multiple indices of aptitude and diligence on attributions of ability and motivation (Williams, 1976), 300 male and female American psychology students were asked to rate the motivation and ability of a fictitious student (TP) who was

alleged to have participated in a multi-session experiment on concept integration.

Diligence was not clearly defined in this study but it was conceptually distinguished from actual performance and was based on how each student appeared to be working (implying quality of effort). TP received fictitious scores on aptitude, diligence, and performance as percentile rankings.

The results revealed that attributed ability was directly related to TP's aptitude scores ($p < .01$) and inversely related to his diligence scores ($p < .001$). However, while attributed motivation was directly related to diligence, it was found to be unrelated to aptitude manipulation.

In a study conducted by Eisner (1937) to determine whether, by means of teacher observation under ordinary classroom conditions, the degree of intelligence and industry possessed by each of the pupils in a class could be ascertained early in a semester, intelligence was referred to as "ability to learn, or to reason, or to meet a new situation." Industry was defined as "diligent application to a task; conscientious unflagging effort." These terms and definitions seem to be similar to ability and diligence as used in this dissertation.

Eisner's study employed pupil activities in actual classroom situations to furnish a number of manifestations that were correlated with intelligence and industry. The

observations made by trained teachers resulted in a preliminary list of 79 intelligence items and 59 industry items.

The items were judged by a number of expert educators for content validity. Eisner (1937) decided to operationalize intelligence and industry by six items from each of the two pools as follows:

Intelligence

1. Asks questions
2. Comprehends and executes teacher's directions during class period
3. Expresses himself clearly
4. Defends his own statements
5. Corrects errors made by other pupils
6. Answers difficult questions correctly

Industry

1. Starts work promptly at the beginning of the period
2. Is actively attentive during the period
3. Brings required books and other needed materials to class
4. Submits homework when due
5. Does homework thoroughly
6. Performs voluntary home tasks. (Eisner, 1937, p. 89)

The results indicated a low correlation between estimates of intelligence and actual intelligence test scores at the end of the fifth day and at the end of the 26th day of the experiment. A similar condition existed for industry. No significant difference was found between mean correlations for experimental and control classes. It was stated that the use of the observational technique

failed to produce any improvement in the estimates of intelligence and industry.

It is to be noted that in Eisner's (1937) study the items that were used to operationalize intelligence and industry were designed for teachers' observations of students and not for students' responses. Furthermore, the items were limited to the classroom situation and no attempt was made to measure students' performance levels or to determine any correlations between intelligence and industry.

Profile of the High-School Dropout

Many of the reform agendas have been focusing on the at-risk students in order to offer dropout prevention measures. The purpose of this aspect of the review of literature is to present a profile of the dropout in order to gain insights for the development of the DI. It is not deemed necessary to report on all aspects of dropout research. Cinal (1982), for example, conducted a comprehensive review on this subject.

The definition of what constitutes a dropout varies widely from school district to school district. Barber and McClellan (1987) gleaned a number of definitions for the high-school dropout from the literature on the subject. The definition that is relevant to this study is "a dropout is a pupil who leaves school, for any reason except death, before graduation or completion of a program of studies

without transferring to another school" (Barber & McClellan, 1987, p. 267).

One of the pertinent indicators of the status of education in the US is the high-school dropout rate. Estimates of the dropout rate varies widely depending on the definitions of dropout used. Rates ranging from 10 to 50% have been reported (Barber & McClellan, 1987).

Many studies have tried to identify the predictors of high-school attrition (for example, Alpert & Dunham, 1986; Barrington & Henricks, 1989; Lowery, 1985). Some of the variables identified were external to the student: father's occupation, mother's occupation, socio-economic level, number of children in the family, etc. However, in this review, the emphasis is on intellective and non-intellective variables that are under the student's control.

Newton (1986) conducted a study on 95 Larkin High School dropouts to develop a prediction model for the early identification of the at-risk students. The findings indicated that a significant relationship existed between the following 22 variables (many of which are non-intervention) and attrition as follows:

- participation in extracurricular activities
- behavior problems reported by school personnel
- percentage of incidence of truancy
- absenteeism during elementary school
- number of elementary schools attended

- number of court appearances due to delinquent referrals by the police
- consumption of controlled substances
- attitudes toward communication in the home
- attitudes toward family members' understanding each other
- attitudes toward family members' acceptance of each other
- average number of years of formal education received by students' mothers and fathers
- incidence of mothers' employment outside the home
- incidence of broken homes
- test scores on the Comprehension Test of Basic Skills in Reading
- number of meals eaten together as a family
- attitude toward difficulty of classes
- incidence of preschool education
- attitude toward quality of education
- attitude toward education in general
- feelings (likes or dislikes) about the school activities
- frequency of church attendance
- total family income

Similar variables were identified by Alpert and Dunham (1986), Cervantes (1965), Hammontree (1978).

Philosophical Foundations for the Conceptualization of Diligence

An Overview

This researcher's concept of diligence in education is predicated upon two main factors: an operational definition for education and views on the nature of man, both of which are rooted in Judeo-Christian principles. White (1903) forwarded a comprehensive definition of education which undergirds a Christian philosophy.

> True education . . . has to do with the whole being and the whole period of existence possible to man. It is the harmonious development of the physical, mental and spiritual powers. It prepares the student for the joy of service in this world and for the joy of wider service in the world to come. (White, 1903, p. 13)

Implicit in this definition are the nature and purpose of education, that is, education of the whole person for service. Education of the whole person implies the harmonious development of the mental or psychological, spiritual, physical, and social dimensions as depicted in an ideal model for educational development portrayed in figure 3.

Each side of the rectangle depicts a dimension of growth or development. Ideally an educationally balanced individual should possess and nurture these four attributes proportionately, so that 'normal' growth (represented by the expanding symmetrical squares) could result. In reality students should be represented by rectangles since it is hardly likely that any one will attain the ideal of perfect balance in all dimensions.

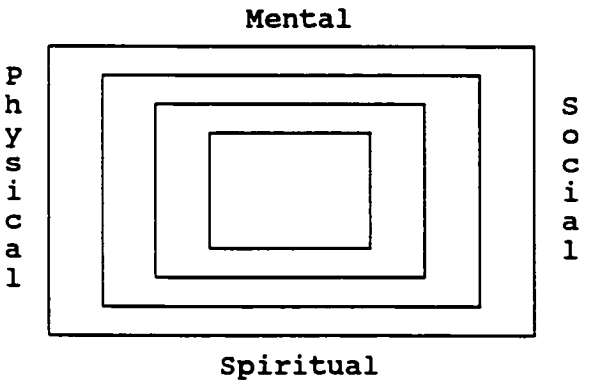


Fig. 3 An ideal model for educational development Designed by Hinsdale Bernard.

Any departure from the ideal spells a relative deficiency in a specific dimension or dimensions, which in reality is the case for most students. The goal of education should be to try to attain and maintain this ideal through diligence. A diligent student may be regarded as one who strives toward this type of balanced development in these four dimensions.

This type of holistic development as typified by the ideal model results from a philosophy that recognizes the authorship of God in the affairs of man. This is the basis of a Christian philosophy of education (Knight, 1980).

Holistic Education

Proponents of the holistic education paradigm have stressed the need to balance the development of the physical, mental and emotional, social, and spiritual aspects in students (Singleton, Johnson, & Henning, 1984).

These authors have concurred with the view advanced by Pelletier (1977) that holism in education runs parallel to the medical model. According to Pelletier:

> If the prevention of pathology is the ultimate goal, then health practitioners and lay men need to begin to consider the whole person. An individual needs to be considered physically, psychologically, and spiritually with the intent of gaining as much understanding as possible about his relationship with his total environment. This environment includes his family, peers, job situation, living situation, his concept of himself and his role in society, as well as his childhood background . . . Holistic medicine recognizes the inextricable interaction between the person and his psychosocial environment. Mind and body function as an integrated unit, and health exists when they are in harmony, while illness results when stress and conflict disrupt this process. (pp. 11-12)

Various areas of specializations have emerged in the field of education to cater to the development of students in these four dimensions. Educational psychology, the sociology of education, and physical education are intended to address the mental and emotional, social, and physical dimensions, respectively.

Most parochial and some private schools emphasize the moral and spiritual development of students by making provision for religious instruction and prayer in school. These practices are usually reinforced in the home, thereby strengthening the spiritual dimension in such students. This is not the case for public school students who comprise the overwhelming majority of students in America.

Ever since the Supreme Court decisions of the 1960s (Engel v. Vitale, Abington School District v. Schempp, and Murray v. Curlett) declaring prayer and the reading of the

Bible in schools unconstitutional, an ongoing debate has continued regarding the place of religion in the public schools (for example, Connors, 1988). During his term of office, President Reagan made several unsuccessful attempts to win Congressional support for reintroducing the matter to the Supreme Court with the intention of having the decisions reversed. President Bush has also expressed similar sentiments in this regard.

Meanwhile, an ongoing discussion continues about the inclusion of voluntary religious activities in the public schools (for example, Robbins, 1987) and teaching about religion in the public schools (for example, Kniker, 1985). Fact is, to use a proverbial expression, while the grass is growing, the horse is starving. Public schools are expected to develop educationally balanced students without any mention of the spiritual dimension. It is as though the "bottom" has fallen out of the system, and it is possible that a sizeable proportion of these students may rarely achieve closure as represented by the holistic paradigm.

There is no guarantee that the inclusion of prayer and/or Bible reading in the public schools, or for that matter private and parochial schools, will totally satisfy the spiritual needs of students. One swallow does not make a summer. First, educators need to recognize that spiritual needs are equally important and sometimes

prepotent to the other psychological, physical, and social needs of students.

Case in point, as part of a mainstream movement to reform and restructure American schools, a renewed drive attempts to foster partnerships between family, school, and community in order to serve the whole child educationally (Davies, 1991). Three common themes were identified as being centrally important, but the spiritual dimension was notably absent. The themes were:

1. Providing success for children. All children can learn and achieve school success. None should be labeled as likely failures because of the social, economic, or racial characteristics of their families or communities.

2. Serving the whole child. Social, emotional, physical, and academic growth and development are inextricably linked. To foster cognitive and academic development, all other facets of development must be addressed by schools, by families, and by other institutions that affect the child.

3. Sharing responsibility. The social, emotional, physical, and academic development of the child is a shared and overlapping responsibility of the school, the family, and other community agencies and institutions. In order to promote the social and academic development of children, the key institutions must change their practices and relationships with one another. (p. 377)

Spirituality and Education

Gill and Thornton (1989) investigated the relationship between religious orientation, self-esteem, and academic performance. In the review of literature, the authors identified a number of studies that supported the relationship between a healthy self-concept and academic

performance (Coplin, 1969; Purkey, 1970; Wylie, 1974; Hummel & Cecil, 1984; Hansford & Hattie, 1982). They also cited evidence to indicate that one of the best predictors of behavior is one's religious belief (Strommen, Brekke, Underwager, & Johnson, 1972).

Gill and Thornton (1989) concurred with Theodore (1984) that spirituality is a legitimate part of life and should receive, therefore, the attention it deserves from the research community. In a comprehensive treatise on this subject Beck, (1986) presented arguments from a philosophical standpoint, for the recognition by both religious and nonreligious people of the role of spirituality in education. He reflected Priestly's (1985) position that spirituality had to do with "interiority," something inside a person.

Beck (1986) made reference to the viewpoint of political theorist and educator Madan Handa (1982) who believed that one's inner being must be brought into harmony with a "Cosmic Consciousness," the Hindu philosophy of God. Furthermore, Handa did not believe that one must be religious in order to be spiritual when he wrote:

> We should make a distinction between religion and spirituality, the former being a special institution and the latter referring to the inner state of consciousness. To the extent religious knowledge deals with inner refinement it may help in spiritual development, but more often it works as a stumbling block because of the bigotry it teaches. (p. 149)

Beck was quick in pointing out that a religious person who believes that spirituality involves a "divine

indwelling" which is brought about, at least in part, by supernatural intervention will have a somewhat different conception of spirituality from the nonreligious person who does not believe these things. However, he emphasized that there is a spiritual dimension to life which is largely the same in religious and nonreligious people and which cannot be ignored without grave consequences.

Beck suggested 12 characteristics of the spiritual person which are listed devoid of their definitions: awareness, breadth of outlook, a holistic outlook, integration, wonder, gratitude, hope, courage, energy, detachment, acceptance, love, and gentleness. This researcher fully endorses these 12 characteristics but is at variance with the source of spirituality.

This writer believes the Christian doctrine of The Trinity, namely: God the Father, God the Son in the Person of Jesus Christ, and God the Holy Spirit. From the Christian's standpoint it is the communication between the Holy Spirit and the human spirit that leads to spirituality, represented by the model:

HOLY SPIRIT + HUMAN SPIRIT = SPIRITUALITY

The fundamental difference with Beck's (1986) and the Christian's view is that spirituality comes from "within" thus reducing his model to:

HUMAN SPIRIT = SPIRITUALITY

The problem with Beck's generic view of spirituality is that, on the one hand, the 12

characteristics demand relationships that interact to bring out the spirituality, but on the other hand, spirituality is a virtue which by its very definition appears to thrive on self-centeredness. It would seem that to omit the dimension of spirituality from education represents a tragedy of mammoth proportions, but to omit the Holy Spirit from spirituality is akin to attempting to fly a conventional aircraft without the atmosphere, which would be both impossible and disastrous.

About 2,000 years ago, Paul one of the New Testament scholars writing under inspiration, operationalized spirituality through nine attributes thus:

> The fruit of the Spirit is love, joy, peace, longsuffering, gentleness, goodness, faith, meekness, temperance: against which there is no law. (Galatians 5: 22, 23 KJV)

To the Christian, spirituality is that dimension which brings an individual in harmony with the Omniscient, Omnipotent, and Omnipresent God, who has condescended to dwell with the human family. God is available and willing to intervene in all aspects of human existence, in general, and in the holistic development of each individual, in particular. His goal is to restore in people His very own image. White, one of the foremost early proponents of the cause of holistic education and who wrote widely on the subject, stated (1903) that

> To restore in man the image of his Maker, to bring him back to the perfection in which he was created, to promote the development of the body, mind, and soul, that the divine purpose in his creation might be

> realized . . . this was the true work of redemption. This is the object of education, the great object of life. Love, the basis of creation and redemption, is the basis of true education . . . The law of love calls for the devotion of body, mind, and soul to the service of God and of our fellow men. (pp. 15, 16)

White (1923) also posited in another of her insightful statements that diligence should characterize the educational enterprise:

> Indolence, apathy, irregularity, are to be dreaded, and the binding of one's self to routine is just as much to be dreaded . . . There should be most diligent and thorough education in our schools, and in order to secure this the wisdom that comes from God must be made first and most important. (p. 373)

While it may not be practical for public education to incorporate such lofty ideals in its philosophy of education, it is a goal worthy of pursuing by both public and private/parochial educational systems in a nation "under God," that has been grappling with a surge of secularism which is threatening to supplant the seeds of spirituality from which this great nation has sprung.

Summary

This chapter presents a review of the literature on the progress of educational reform during the last three decades and demonstrates that reform initiatives by and large excluded the main actor in the educational process--the student.

The case is made for the need to develop an inventory that could measure the extent and quality of effort expended by students toward holistic educational development (diligence), that could be used in conjunction

with measures of ability to predict student competence. A major part of the review of literature was devoted to identifying variables that could achieve this purpose.

The tenets of holistic education provided the philosophical foundation for operationalizing the construct diligence. Holistic education purports to integrate the mental, physical, spiritual, and social dimensions of an individual in the educational process. The spiritual dimension is identified as the most neglected dimension in the public educational system and receives the most attention in this aspect of the review of literature that deals with holistic education.

CHAPTER III

PROCEDURES AND METHODOLOGY

Introduction

This chapter presents a description of the research design and methodology, a description of the population and sample, the development of an operational definition for the construct diligence, theories and procedures for the development of the DI itself including the pilot studies, and procedures for collecting the data and testing the hypotheses.

Research Design and Methodology: An Overview

The first part of the study involved the development of the diligence inventory (DI). Essentially, this process employed two pilot studies that helped to refine the instrument. The first pilot study was conducted on the 120-item instrument that emerged after it was cleared for content validity by a number of judges.

The results from the first pilot study were item analyzed in order to estimate the reliability of the instrument as a whole and the point-multiserial correlation coefficient of each item. Items with point-multiserial

correlation coefficients of less than .25 were excluded from each succeeding item analysis, except in special cases where items with lower values were retained for content validity purposes.

This procedure was repeated until a 55-item instrument of optimal reliability and content was obtained. The instrument was refined, mainly by rewording some items to render them negative statements with respect to diligence, or to achieve greater clarity.

At this stage, the instrument was subjected to a second pilot study that led to further refinement. Ideally, another pilot study would have been appropriate at this stage, but it was not deemed crucial since with the minor changes the reliability remained fairly constant and the point-multiserial correlation coefficients of the items generally improved. This revised DI that resulted from the second pilot study was used for the actual study in order to make a more formal assessment of the reliability and construct validity of the DI.

Construct validity was estimated using the Known-Group Difference procedure (Mueller, 1986). Teachers were asked to place the students in the study in three categories of high, average, or low diligence. A significant difference between these groups on diligence indicated that the instrument possessed construct validity.

Factor analysis was also used to determine the best composition of clusters of items (Child, 1979; Gorsuch,

1983; Rummell, 1970). This procedure was used to adjust the composition of the preconceived scales of diligence. In this way factor analysis assisted in establishing face validity of the DI.

The second phase of the study employed correlation, multiple-regression, and analysis of variance (ANOVA) in an ex post facto type of research (Kerlinger, 1986). Five hypotheses investigated the relationships between ability, diligence, and competence. A multiple-regression model for predicting competence from diligence and ability was developed (Pedhazur, 1982). A similar model for predicting competence from ability and the scales of diligence was also investigated.

Four hypotheses investigated gender, maturational, and demographic differences in diligence using One-Way and Two-Way ANOVA (Winer, 1971). One-Way ANOVA was used to test the hypothesis associated with the Known-Group difference procedure.

Population and Sample

An attempt was made to select a stratified random sample of approximately equal numbers of juniors and seniors to be representative of all juniors and seniors who attended the 58 schools in five southwestern Michigan counties. The 11 private and 47 public schools were placed in four enrollment categories: size A (299 and below), size

B (300 - 499), size C (500 - 799), and size D (800 and over).

It was decided that a representative number of schools from which the sample would be chosen was 14. To allow for a possible 50% declension and/or attrition rate 29 schools were randomly selected, taking care to achieve proportionality with respect to size, county, and type (private/public). Eventually 11 schools agreed to participate in the study.

As it turned out, five schools responded. Although this included four public schools and one private school, and each category and size was represented, this sample was not deemed representative of the target population because it fell far short of the required number of schools and clearly was not representative with respect to school type, size, and ethnic backgrounds. Because of this limitation, the sub-population for this study consisted of all juniors and seniors who attended the five schools that participated in the study.

The sample consisted of 250 students made up of entire classes of juniors or seniors. This number represented 38% of the inventories that were distributed to the 11 schools that agreed to participate in the study. Upon eliminating responses that were inappropriate 237 were used in the analyses.

Operational Definition of Diligence

Framework for the Operationalization of Diligence

In order to generate items that would sample the universe of diligence items, it was necessary to provide a working definition for the construct. The starting point for the operationalization of diligence was the dictionary definition. The *Funk and Wagnalls Standard Dictionary* defined diligence as "assiduous application; industry; proper heed to attention, meticulous care" (Marckwardt et al., 1965). *Webster's Third New International Dictionary Unabridged* defined diligence as: "care, persevering application; devoted and painstaking application to accomplish an undertaking" (Gove, 1961).

A combination of factors provided the framework for operationalization of the construct diligence: (1) a prototype study Dimensions of the Conceptualization of Diligence (Bernard, 1986), that was undertaken by this investigator as a project for a course in factor analysis at Andrews University (Appendix B), (2) a joint class project for the course Techniques of Scale Development at Andrews University during the 1989 Winter quarter (Appendix C), and (3) a review of the literature on the profile of the high-school dropout, school reform, attribution theory, control theory, the effort-ability debate for explaining competence, some variables for the prediction of competence, a review of some related instruments (for

example Brown & Holtzman, 1967; Raygor, 1980; Weinstein, Schulte & Palmer, 1987), as well as some philosophical foundations for diligence that included the tenets of Christian education and the holistic education paradigm.

The exploratory prototype version served to suggest some dimensions of diligence. The 54-item instrument was factor analyzed and inappropriate items were eliminated until eventually 24 items were retained. Three factors were rotated which were named:

Factor I - Conformity

Factor II - Self-discipline /Autonomy

Factor III - Application-Organization.

The 54-item instrument yielded an alpha reliability coefficient of .8325, and the 24-item instrument a reliability coefficient of .7767. Apart from two items with values of .12 and .14, point-multiserial correlation coefficients ranged from .25 to .70.

The joint class project served as a sounding board for the ideas that were presented on diligence. The members of this class provided items and served informally as preliminary judges for the content validity of the DI. The additional items that were generated helped to refine and focus the concept and facilitated the formulation of an operational definition for diligence.

It was decided to operationalize the construct diligence for educational purposes through three domains: the Industry domain, the Citizenship and Character domain,

and Cognitive Skills domain. The Industry domain was associated with all four dimensions of holistic educational development: mental, physical, spiritual, and social. The Citizenship and Character domain related more to the spiritual and social dimensions, and the Cognitive Skills domain related to the mental dimension.

Each domain was operationalized by scales and the scales in turn were defined by individual items. The initial version of the DI for this study was based on the operational definition that follows. The review by a panel of judges and the two pilot studies led to some modifications in the definition. The revisions of the instrument and the final version of the DI are presented in Chapter 4.

Operational Definition of Diligence

Diligence in a student is defined as an expression or reflection of the effort expended toward holistic or balanced development by the student in the mental, physical, social, and spiritual dimensions, as indicated through measurement in the domains of industry, citizenship and character, and cognitive skills, that are appropriately defined by relevant scales.

I. The Industry domain is represented by the scales
   a. Time Management
   b. Study Skills
   c. Organization

d. Motivation

e. Persistence

II. The Citizenship and Character domain is represented by the scales

a. Discipline and Devotion

b. Conformity

c. Integrity

d. Autonomy and Responsibility

III. The Cognitive Skills domain is represented by the scales

a. Concentration and Attentiveness

b. Literary Skills

c. Information Assimilation and Perspective

Definitions of Domains and Scales

I. Industry domain--earnest or constant application to school work.

Time Management--economical and wise use of time for maximizing the scope and efficiency of one's operations.

Study Skills--strategies that will make studying a comfortable, pleasurable, and fruitful exercise.

Organization--procedures that provide the "correct" setting for the execution or results of activities that are geared toward a successful state of affairs.

Motivation--drive to get started along a certain course of action with an intended result in mind.

Persistence--maintaining an enduring effort on a certain course of action or resolve in order to see it come to fruition.

II. Citizenship and Character domain--practices and qualities that make an individual physically, spiritually, socially, and morally sound.

Discipline and Devotion--practices that contribute to maintaining a healthy body and mind or spirit.

Conformity--the act of maintaining harmony or the status quo in an organized setting.

Integrity--honesty.

Autonomy and Responsibility--demonstration of independence and maturity with respect to dealing with one's self and significant others.

III. Cognitive Skills domain--skills that relate to the conscious thinking processes.

Concentration and Attentiveness--the act of focusing attention on a problem, task, or impending situation.

Literary Skills--skills pertaining to dexterity in reading and the use of library facilities.

Information Assimilation and Perspective--the process by which all new experience, when received into the consciousness, is modified so as to be incorporated with the results of previous conscious processes and the interrelation in which a subject or its parts are mentally conceived.

Theories and Procedures for Instrument Development

Content Validation of the DI

Kerlinger (1986) defined content validity as the representativeness or sampling adequacy of the content--the substance, the matter, the topic--of a measuring instrument. Content validation is guided by the question: Is the substance or content of this measure representative of the content or the universe of content of the property being measured? (p. 417). The method used for establishing content validity of the instrument was that of using competent judges to evaluate the items (Mueller, 1986).

Mueller indicated that scales have been successfully constructed with as few as 10 to 15 judges. A cautionary note he sounded was that judges must be reminded over and over again that they should respond to the inventories solely on the favorableness and unfavorableness of the statements and not on the basis of their agreement or disagreement with the statements.

The principals of three high schools (one private and two public) in Berrien County were contacted by letter (Appendix A, letter 1) during Fall quarter, 1989, for suggested names of teachers, counselors, and administrators with at least five years experience, who could be approached and who might be willing to serve as judges of the content of the DI. At the same time, a request was

made for students of these schools to participate in the first pilot testing of the instrument.

In all, the 12 judges comprised of five teachers, four counselors, and three administrators (Appendix C). One of the judges contacted was a superintendent of a parochial school system and a church minister, from outside the counties where the study was conducted. Each judge was sent a cover letter (Appendix A, letter 2) explaining the nature of the exercise, the DI to be judged (Appendix D), and the definition for diligence as found in this chapter.

The judges were asked to indicate by choosing "Yes" or "No" whether the domains were dimensions of diligence, whether the scales represented the respective domains, and the appropriateness of the items to each scale. The judges were invited to offer suggestions as to the addition, removal, or alteration of items or scales as the case may be. The results of this exercise are presented in Chapter 4 and Appendix D.

As a result of the scrutiny by the judges, some minor changes were made which are detailed in Chapter 4. The 120-item DI that resulted is presented by scales in Chapter 4. The actual instrument that was used for the first pilot test is found in Appendix E.

Construct Validation of the DI

Construct validity asks the question: To what extent do certain explanatory concepts or qualities account

for performance on the test (Isaac & Michael, 1981). Construct validity in this study was estimated using the Known-group Difference procedure (Mueller, 1986).

For this procedure teachers were requested to subjectively classify students into three categories of diligence: low (1), average (2), or high (3). If there was a significant difference in the actual diligence scores (from the DI) of the three groups of students, the validity of the DI could be affirmed. In other words, the DI would be able to correctly assign students as having low, average, or high diligence to correspond to the teachers' estimations of the students.

Based on this method, the three groups were found to be significantly different from each other at the .001 level of significance. The mean diligence scores for the low, average, and high categories of students were 169.7, 181.8, and 198.3, respectively. Full details are presented in Chapter 5.

Factor Analysis and Face Validity of the DI

Factor analysis is a mathematical technique for determining the underlying dimensions of a particular construct. It has three general objectives (Frane & Hill, 1974):

1. to study the correlations of a large number of variables by clustering the variables into factors such that variables within each factor are highly correlated

2. to interpret each factor according to the variables belonging to it, and
3. to summarize many variables by a few factors.

The factor analysis model expresses each variable as a function of factors common to several variables and a factor unique to that particular variable:

$$z_j = a_{j1}F_1 + a_{j2}F_2 + \ldots + a_{jm}F_m + U_j$$

where

z_j = the jth standardized variable

m = the number of factors common to all the variables

U_j = the factor unique to the variable z_j

a_{ji} = factor loadings

In theory, the number of factors should be small and the contributions of unique factors also should be small. The individual factor loadings (or correlations with the factors), a_{ji}, for each variable should either be very small or very large so each variable is associated with a minimal number of factors; the ideal is that a variable is correlated with only one factor.

The communality of a variable is that portion of the variance that can be accounted for by the common factors. In other words, communality is the sum of the variance associated with each factor and is actually the sum of the squares of the factor loadings on all the related factors for that particular variable. For example, if a variable

correlates perfectly with two factors, with correlation coefficients of .8 with factor I and .6 with factor II, respectively, then the communality will be ($.8^2 + .6^2$) or 1.0. In this case all the variance is explained by the two factors.

If however the communality of a variable is .75, this means that the variance of the variable as reproduced from only the common factors would be three-fourths of its observed variance. The variable's uniqueness U_j is defined as that portion of variance excluding the variance attributed to the common factors, which in this case is one-fourth of the observed variance (Gorsuch, 1983). Furthermore, unique variance is made up of two parts--specific variance which is associated with the variable, and error, which is unexplained variance.

Communality relates to both the validity and reliability of a variable. Validity is the ratio of common factor variance (communality) to total variance. Expressed as a percentage, communality represents validity. The reliability of a variable includes the common factor variance and specific variance, hence reliability will be equal to or greater than the validity or communality (Kerlinger, 1986). Communality, therefore, gives an indication of the reliability and validity of a variable in an instrument. Factor loadings and communalities of .30 and above are considered to be acceptable (Child, 1979).

Factor analysis was used in an effort to establish

the underlying dimensions of the construct diligence, thereby giving support to decisions about the face validity of the instrument. Initially six factors were extracted to correspond to the six scales that were proposed by item analysis. This procedure was repeated for five, four, and three factors. The most suitable factor structure was obtained for the five-factor solution.

As a result of the factor analysis, the number of scales was reduced by one, from the six suggested by the item-analysis procedure. The items in the factors were very similar to the items in the scales from the item-analysis procedure. The five factors seemed to have more face validity than the six item-analysis scales. Chapter 4 presents more details on these results.

Reliability

Reliability, as it relates to this study, is an estimate of the internal consistency of the DI. A test is said to be internally consistent if all of its items measure "the same thing" (Martuza, 1977).

The method used to determine the internal consistency of the DI was the estimation of the Cronbach alpha reliability coefficient by Kuder and Richardson (1937). In order to understand the nature of the alpha coefficient, the split-half procedure for assessing internal consistency is herein explained.

In order to estimate the internal consistency of a

test or instrument using the split-half procedure, the test is administered once to a suitable population of interest and under suitable conditions. The test is then divided into two subtests of equal numbers of items. The most commonly used method is to group all the odd-numbered items as one subtest, and all the even-numbered items as another subtest.

Each subject will then have two subtest scores. The odd-numbered subtest total scores are then correlated with the even-numbered subtest total scores for all the subjects. The result is a coefficient of equivalence. The ideal value for perfectly equivalent subtests is 1.00. One can infer that such a test exhibits perfect internal consistency or reliability, a situation that does not exist in practice.

The alpha-reliability procedure estimates internal consistency in a similar manner as the split-half method. Rather than being based on a division of the test into two subtests of equal length, alpha effectively treats each item as a mini-test in itself. For example, a 50-item test or instrument is viewed as 50 one-item tests. If all the items in a test or instrument are measuring the "same thing," the correlations among the items will be relatively high and alpha will be close to 1.00. One formula for computing alpha is:

$$\text{alpha} = \left(\frac{k}{k-1}\right)\left(1.00 - \frac{\Sigma \text{Var}(i)}{\text{Var}(X)}\right)$$

where: k = number of test items, ΣVar(i) = sum of the variances of the various item score distributions, and Var(X) = variance of the distribution of test scores.

The Item Weight Program of the Statistics Library at Andrews University was used to estimate reliability coefficients of the inventory and point-multiserial correlation coefficients of the items. This program inserts the middle score of the Likert scale for missing values (a 3 in this case). Of the 237 subjects, 21 cases fell in this category but in no case were more than 3 such values inserted. (See Appendix J, columns 21 to 75).

The recommended range of acceptable reliability coefficients is about .70 to .90, with values exceeding .90 only in rare instances (Anderson, 1981; Henerson et al., 1987). The values obtained for the DI fell within this range for the pilot studies and the actual study (.8300 to .9199).

The recommended range for the sub-scales of an instrument are usually more conservative because the sub-scales are intrinsically shorter than the parent scale. The range for this study fell for the most part within the recommended values of .46 to .93 (Weinstein et al., 1988).

A point-multiserial correlation coefficient is generally considered acceptable by test constructors if it lies within the range .25 and .75. However, these upper and lower limits might be relaxed for content validity

purposes, especially if such items are hard to come by (Lewis, 1975).

The Composition of the DI

The prototype DI and a list of perceived topics for the content areas of the construct diligence were submitted to a graduate class in Techniques of Scale Development at Andrews University, during the 1989 Winter quarter (Appendix C). The topics for the content areas were as follows: time management, concentration, information processing, selecting main ideas, self-testing, test strategies, self-discipline, autonomy, organization, preparation, persistence, curiosity, study skills, and conformity. In addition, dictionary definitions of diligence were provided.

As a joint-class project, students were asked to submit 10 items on diligence, with about 50% stated positively and 50% stated negatively. A total of 79 items were written. The class judged the items for content validity and those judged inappropriate were discarded. Duplications were eliminated and eventually 51 items were chosen. The researcher was then asked to add 29 items to make a total of 80 items for this class project, taking care to avoid further duplications (see Appendix C).

The inventory was based on a Likert-type scale (Mueller, 1986) consisting of a list of items with five possible choices: (1) never, (2) seldom, (3)

frequently, (4) usually, (5) always. Each of the nine students in the graduate class was asked to administer the instrument to five students (juniors and/or seniors).

This 80-item instrument yielded a reliability coefficient of .9032. Twenty-five items had point-multiserial correlation coefficients below .30 and some of these were eliminated successively. The 74-item, 62-item, and 57-item instruments yielded reliability coefficients of .9149, .9276, and .9309, respectively. More statistical details of this class project are presented in Chapter 4.

This project helped to endorse some of the scales for the operationalization of the construct diligence, provided some valuable items on diligence that were prejudged for content validity by a panel of experienced educators, and gave an indication of the reliability coefficients to anticipate for the fully developed DI.

Another 67 items were added to the 59 items from the class project inventory (the 57 items plus items 64 and 72 which were included for content validity). These additional items aimed at improving some of the scales and defining other scales that were not included in the class project. About twice the number of items envisioned for the instrument were generated since it was anticipated that inappropriate items would be eliminated by the statistical procedures for estimating the point-multiserial correlation coefficients of the items. The Likert scale used at this

stage of the development was: rarely (0), occasionally (1), sometimes (2), usually (3), and almost always (4).

Pilot Studies

Two pilot studies were conducted in order to eliminate poor items, improve on the wording of some of the items, and to provide preliminary estimates of the reliability and construct validity of the DI. The first pilot study served to suggest the most efficient and effective way to conduct the testing and gather information about students' GPAs and standardized test scores from school records. Both pilot studies gave an idea of the response rate to expect for the study.

For the first pilot study, a package was hand delivered to the respective coordinators in the three schools that agreed to participate during the 1990 Winter quarter. The package contained a cover letter (Appendix A, letter 3), a number of DIs (Appendix E) based on a prior arrangement with a school administrator, a corresponding number of answer sheets for machine scoring, a corresponding number of letters seeking parental consent for students to participate in the study (Appendix A, letter 4), instructions for the proctor to administer the test (Appendix E), and students' performance measures sheets (SPMS) for recording students' scores (Appendix H). In all, 220 inventories were distributed and responses were received from 83 students who agreed to participate in the

study, representing a response rate of 38%. Nine cases were eliminated because of too many missing values or patterned responses.

The first pilot study led to a reduction in the number of items from 120 to 55, and the number of scales from 12 to 6 as indicated in Chapter 4. A number of items were reworded to introduce some more negative items, and the demographics section was revised (see Appendix F). The refined version of the DI with the six scales is presented in Chapter 4.

The second pilot study aimed at simulating as closely as possible the actual administration of the DI. Two public high schools in Berrien County agreed for their students to participate in the second pilot study in early 1990 Spring quarter. Similar packages as for the first pilot testing containing return addressed, stamped envelopes were hand delivered to the principals. One school received 60 DIs and the other received 35.

This time students were asked to indicate their responses on the DI itself instead of on separate answer sheets to reduce the clerical work for school personnel. Inventories were completed for 35 of the 60 students from one of the schools, representing a response rate of 37%. Two cases were dropped because of incomplete data and item analysis was performed on the remaining 33 subjects.

As a result of the second pilot test, 10 items were reworded for more clarity and the demographics section was

again refined. The revised version of the DI that was used in the actual study is presented by domains and scales in Chapter 4. (See Appendix G for the actual instrument).

Data Collection Procedures

The 29 schools selected were initially contacted by telephone during the 1990 Spring Quarter. The nature of the study was explained to the principal or representative (Appendix A, letter 5). The 29 contact persons agreed to accept a package for study, explaining the nature of the involvement of the students, and the role of the staff in administering the DI and recording relevant data. The package contained a cover letter, the DI, an SPMS, and directions for the proctor.

The SPMS was designed to record students' scores on ability, competence, and diligence. For ability measures, scores on ACT, PSAT, or SAT were to be obtained from the school records. Ability measures submitted by the school personnel consisted of the composite ACT, and verbal, quantitative, and composite PSAT scores. It was therefore necessary to convert PSAT and SAT scores to an ACT equivalent in order to have a single scale for testing the hypotheses.

The more recent, enhanced ACT composite was used for testing the hypotheses. This meant that ACT scores that were earned before the change to the enhanced ACT went into effect in October 1989 had to be converted. Tables

were available from ACT for making the conversion from former ACT to enhanced ACT, and SAT composite to the former ACT composite score. Conversion tables were requested from ACT and appear in tables 39 and 40 in Appendix I.

However, no concordance tables were available for making a direct conversion from PSAT composite to ACT composite. Also, PSAT composite scores were not provided by the one school that used that test. However SAT scores were estimated from PSAT verbal and quantitative scores by multiplying the latter by 10 and adding them (College Entrance Examination Board, 1989).

For competence measures, students' first semester GPAs as well as cumulative GPAs were obtained from the schools' records. The GPAs were based on a variety of subjects and reflected what students were taking at the time. Teachers and administrators believed that this was a more practical approach as compared to computing GPAs from four subjects as requested, in an attempt to achieve uniformity. The four subject areas were expected to be English, mathematics, science, and social studies.

A teacher or counselor was asked to make a subjective estimate of diligence for each student, indicated by a 1 (for low diligence), a 2 (for average diligence), or a 3 (for high diligence). These subjective scores were important for establishing construct validity of the DI by the Known-Group difference procedure.

The SPMS was also designed to facilitate the

matching of students' performance measures with their completed DIs. In order to achieve this, it was suggested that each student be given a code that would be recorded on both the DI and SPMS. A section on the SPMS was provided for names of students for internal use only in their respective schools. A copy of the completed SPMS without names was returned to the researcher upon completion of the testing.

After one week, the principals were again contacted by telephone to find out their responses with respect to their schools' involvement with the study. Initially twelve principals agreed to participate, but one school declined immediately upon receiving the package. The cover letter (Appendix A, letter 6) indicated the contents of the package with the directions for the testing. It was decided to use whole classes instead of the numbers that were suggested in the previous contact letter. Administrators believed that trying to sample students from a class or classes would break up schedules and complicate matters.

Five schools (four public and one private) returned their packages over a two-month period. Two follow-up telephone calls were made to each of the other six schools during that time, followed by a reminder letter (Appendix A, letter 7) during the 1990 Fall quarter to three schools that had promised to respond. Two factors might have contributed to negative or lack of responses: the volume of

clerical work in completing the SPMS and the timing. The number of participating schools remained at five. A total of 250 completed DIs were returned out of a possible 650, representing a response rate of 38%.

Statistical Analysis

Item analysis and factor analysis were used in the development of the DI. Before these procedures were undertaken it was necessary to reverse negative items with respect to diligence.

The scores of the negative items were reversed so that all the items were scored in the same direction. This procedure was used to insure that the correlation coefficients for the item analysis and factor analysis came out positive for the most part.

The DI was scaled so that the highest score (5) represents the most diligence and the lowest score (1) represents the least diligence. Reversing the scaling for negative items results in maintaining that direction. For example, in a negative item like "I have poor study habits," where the very diligent students were to choose the response "never/rarely," (1), and the students at the opposite extreme were to choose "almost always", (5), these scores were reversed so that diligence gets the 5 and vice versa. In other words, this process corresponds to rewording the item to read: "I have good study habits."

The Pearson r product-moment correlation

coefficients were obtained for hypotheses 2, 3, and 4. Hypotheses 5 and 6 employed multiple-linear regression analysis. Hypothesis 1, 9, and 10 employed One-Way ANOVA; Two-Way ANOVA was used to test hypotheses 7 and 8. The significance level was set at .05.

Hypotheses to be Tested

The hypotheses were tested for high school juniors and seniors as a combined group. They are stated in the null form.

1. There is no significant difference in diligence (as measured by the DI) between the three groups of students that teachers subjectively classified as having low, average, and high diligence.
2. There is no significant correlation between students' diligence and ability scores.
3. There is no significant correlation between students' ability and competence scores.
4. There is no significant correlation between students' diligence and competence scores.
5. There is no significant multiple correlation between competence and a linear combination of diligence and ability.
6. There is no significant multiple correlation between competence and a linear combination of the scales of diligence and ability

7. There is no significant gender and grade main effects in diligence among high-school students.
8. There is no significant gender by grade interaction in diligence among high-school students.
9. There is no significant difference in diligence between high-school students in the three age groups defined in this study.
10. There is no significant difference in diligence between high-school students in the four socioeconomic levels defined in this study.

Summary

This chapter presented details of the research design, population and sample, an operational definition of diligence, procedures for the development of the DI including reliability and validity definitions and estimates through pilot tests, and the procedures for data collection. The statistical analyses associated with testing the null hypotheses were also outlined.

CHAPTER IV

DEVELOPMENT OF THE DILIGENCE INVENTORY

Introduction

The purpose of this study was to develop a diligence inventory aimed at explaining and predicting competence (measured by GPA) in combination with ability (measured by ACT). This chapter reports on the development of the Diligence Inventory. The findings with respect to testing the hypotheses are presented in chapter 5.

The Population and Sample

A more detailed description of the population and sample is presented in chapter 5 where demographic differences in diligence are investigated. The sample consisted of 237 juniors and seniors from five southwestern Michigan schools that constituted the sub-population for this study.

An Overview of the Instrument Development Process

The instrument development process went through several steps as summarized in Table 1. The intermediate instruments that resulted from each step were given code names to facilitate their referencing and to distinguish

TABLE 1

A SUMMARY OF THE STEPS IN THE DEVELOPMENT OF THE DILIGENCE INVENTORY

Step	Process	Product
1	Item analysis and factor analysis of a prototype DI-54	DI-24
2	Item-analysis of DI-80 made up of items from DI-24 and class contributions	DI-57
3	Items added to DI-57 to produce the first full version	DI-126
4	DI-126 judged for content	DI-120
5	First pilot test on DI-120, Item analysis and revision	DI-55/P1
6	Second pilot test on D-I55/P1, Item analysis and revision	DI-55/P2
7	Actual study using DI-55/P2, Item analysis	DI-55/S
8	Factor analysis of DI-55/S Revision	DI-55/F
9	Item analysis of DI-55/F, Comparison of DI-55/S and DI-55/F	DI-55/F
10	Validation of the DI	Validity
11	Redefinition of scales	Diligence Revised

between process and product. The code name specifies the length of each edition and in some cases, other information. For example, Step 5 involved the first pilot study the code name "DI-55/P1" reflects this.

In **Step 1** a prototype instrument (DI-24) was developed by this researcher from a wider collection of items (DI-54) as a project for a class in factor analysis. In **Step 2**, the DI-54 was used as the point of departure for a joint project for the class Techniques of Scale Development at Andrews University, during the 1989 Winter quarter. This instrument developed by the class (DI-80) was reduced to the DI-57 upon item analysis.

In **Step 3**, The DI-57 was expanded to the DI-126 which was judged for content in **Step 4** to produce the DI-120. Steps 1, 2, and 3 are considered preliminary representations of the DI.

In **Step 5**, the first pilot study was conducted on the DI-120, which, upon item analysis produced the DI-55/P1. The number of scales was reduced from 12 to six in this step. The number and content of the items in the instrument from Step 5 to Step 11 are the same. Changes related only to the rewording of items and altering the composition of scales.

In **Step 6**, the DI-55/P1 was subjected to a second pilot study that resulted in the rewording of some items and the readjustment of some of the items in the scales to produce DI-55/P2.

The DI-55/P2 version was used for the actual study in **Step 7**. The item analysis procedure was used to estimate the reliabilities of the total instrument and the six scales, and also the point-multiserial correlation coefficients of the items in the scales. The instrument is labeled DI-55/S in this step.

In **Step 8**, the DI-55/S was factor analyzed to produce a 5-factor instrument labeled DI-55/F. The composition of the scales (the five factors) changed considerably.

In **Step 9**, item analysis was performed on DI-55/F to estimate the reliabilities of the five factors and the point-multiserial correlation coefficients of the items in the factors (scales). Upon comparing the coefficients of the 6-scale DI-55/S with those of the 5-factor DI-55/F, the latter was found to have better values. A five-dimensional version was therefore adopted for the definition of diligence.

Step 10 was associated with the construct validation of the inventory and in **Step 11** a revised operational definition of diligence was advanced.

A full discussion of the steps follow. Steps 1, 2, and 3 are discussed together as they relate to the preliminary versions of the instrument.

Preliminary Versions of the DI

The early prototype 54-item diligence inventory (DI-54) showing the signs with which the items were scored is presented in Appendix B. Item analysis was performed after the negative items were reversed **(Step 1)**.

The 54-item instrument yielded a reliability coefficient of .8325. This instrument was factor analyzed until 24 items (DI-24) yielded three distinct clusters or factors that were named Conformity, Self-discipline and Autonomy, and Application-Organization. The composition of the three factors is presented in Appendix B. This 24-item instrument yielded a reliability coefficient of .7767.

Table 38 in Appendix B presents the point-multiserial correlation coefficients of the items for the 54-item and 24-item instruments. All but the 12 highlighted items (Appendix B) were included in the 126-item instrument that was presented to the judges for content validation. Many of the items were reworded for greater clarity, hopefully, without sacrificing content, prior to having the DI judged.

Five of the 12 items that were eliminated (18, 21, 23, 26, and 28) had point-multiserial correlation coefficients well above the criterion of .2500. The decision to drop these items was based partly on an their questionable face validity, and the fact that better items of similar content were available. When they are in short supply, it is sometimes necessary to retain items that do

not meet the criterion set. Seven such items (2, 6, 13, 14, 15, 34, and 50) did not meet the criterion value of .2500 and were retained.

The 80-item inventory (DI-80) that was prepared as a joint project for the class Techniques of Scale Development, showing the sign with which each item was scored, is found in Appendix C. A list of contributors to the class project is also presented in Appendix C. Item analysis was performed and the instrument was successively reduced to 57 items (DI-57) in four stages **(Step 2)**.

The basis for eliminating the items this time was mainly that of low point-multiserial correlation coefficients (below .2500). The reason why it is best to eliminate items through several steps is that when the very worst items are eliminated, the correlation coefficients of moderately low items sometimes exceed the criterion value. These changes can be monitored over a series of item analyses, thus leading to more sound judgments to retain or drop items.

The 80-item, 74-item, 62-item, and 57-item instruments yielded point-multiserial correlation coefficients of .9032, .9149, .9296, and .9309, respectively. Table 39 in Appendix C compares the point-multiserial correlation coefficients of the 80-item and the 57-item versions. The highlighted items in Appendix C were not included in the 126-item DI that was presented to the judges for their evaluation.

Based on the definition of diligence provided in Chapter 3, 126 items (DI 126) were written for 12 scales as shown in Appendix D **(Step 3)**. This DI included items from the early prototype version, the joint class-project version, and additional items that provided a reasonable representation of the 12 scales.

Content Validation of the DI

Twelve experienced educators were asked to evaluate the DI for content (Appendix D). It was predetermined that a two-thirds majority vote would favor a domain, scale, or item for inclusion in the inventory (**Step 4**).

Unanimous agreement was reached on the domains of diligence and the scales of the respective domains. The judges made suggestions to reword some items and eliminate others. The comments and suggestions that appear in Appendix D influenced the minor changes. The affected items are highlighted in both the 126-item DI that was judged (see Appendix D) and the 120-item DI for the first pilot study that appears in this section.

The nine items that were eliminated from four scales (the Organization scale, the Motivation scale, the Concentration and Attentiveness scale, and the Literary Skills scale) in the original 126-item instrument are in parentheses in Appendix D. The eight new items that were added to three scales (the "new" Organization and Study Skills scale, the Integrity scale, and the Literary Skills

scale) are indicated by asterisks in the presentation in this section.

For the numbering in the actual 120-item instrument, the items were arranged by placing an item from each scale in succession and repeating the process until all the items were included. Care was taken to alternate judiciously the 48 negative and 72 positive items, the signs of which are shown in the presentation that follows. Appendix E presents the actual DI that was used for the first pilot study and the instructions for the proctor to administer the testing. The 120-item DI is presented by domains, scales, and items.

The 120-Item DI by Domains and Scales

Industry

Time Management

1. (I do homework before I spend time with friends.)
15.- I play games first and do homework after.
120.- If assignments are a little late it is ok.
81. (I turn in homework assignments on time.)
87.- I wait until the "last minute" to do school projects.
27.- I like to date after school.
48.- I spend more than four hours each evening relaxing.
56.- I like to socialize with friends after school.
34. (I make constructive use of my leisure time.)
77.- My social life disrupts my studies.

Organization and Study Skills

70. (My friends see me as very organized for school.)
119. (I review my notes before the next class.)
47. I make use of group review sessions that are available.
16. (I take good class notes.)
91.- My class notes are disorganized.
2. I have poor study habits.
35. (I like my assignments to look neat and tidy.)

76. (I try to study in a quiet place.)
26. I study where the lighting is good on my eyes.
105.-*I try to study with the radio turned on.
57.-*I try to study with the television turned on.

Motivation

17. (I want to do the best I can in school.)
101.-(I am satisfied with a "C" grade even though I could do "A" work on my assignments.)
93. (I try to do outstanding work in all my classes.)

3.- Some subjects are so difficult they are not worth the effort.
25. (My parents help me do my homework.)
114.- My parents have to urge me to study.
58. (I am able to begin assigned tasks without prompting.)
92. (I complete extra credit assignments.)
18.- During a group project, I let other people do most of the work.
36.- My parents have to remind me to do my homework.
4. When something interests, me I read all I can about it.
86. (I like to take up academic challenges.)
49.- I'll skip classes if I can get away with it.
75. (I do my assignments as soon as I get them.)
106. I do extra reading on my own.
37. (I work very hard to get good grades.)
108. (I am enthusiastic about doing my assignments.)
59. (I set high standards for myself in school.)

Thoroughness and Persistence

5. (I take a lot of care when I do my assignments.)
19. (I make sure that my assignments are done correctly.)
50. (I do not turn in an assignment until I am sure that it is correct.)
103. (I take care to complete my assignments.)
99.- I hurry through my school work so that I can do other things.
28. (I strive to do my assignments to the best of my ability.)
61. I am persistent when it comes to school work.
82. (I proofread all assignments before turning them in.)
20. (Even when I am tired I try to complete my assignments.)
94.- I ignore details in assignments given to me.
112. (I finish projects that I start.)
46. I tend to skip over material to get to the end of a project.
69.- When school work is difficult I study only the easiest parts.

6.- I tend to give up quickly when I run into a difficult problem.
39. I spend more than 20 hours a week studying outside of class.
117.- I have considered dropping out of school to avoid studying.
88. (I can study for more than two hours at a time.)

Citizenship and Character

Discipline and Devotion

7. (I have a daily exercise program.)
21. (I get adequate rest every day.)
83.-(I tend to over eat.)
51. (I like to have quiet moments for reflection.)
100. I follow a routine for waking and going to bed.
38. I tend to overwork myself.
8. (Nature appeals to me.)
60.- I oversleep during the school week.
67. (I keep my weight under control.)
104.- I drink alcoholic beverages.
45. (I enjoy attending church or religious services.)
80. (I drink adequate water every day.)
29.- I like to eat junk food.
113. (I like to pray every day.)

Conformity

62. (I like to obey my teachers promptly.)
9.- I have to be disciplined by my teachers.
95. (I try to cooperate with my teachers.)
30. (I try to obey my parents/guardians promptly.)
109. -I disrupt classes by talking out of turn.
89. -I have to be disciplined by my parents/guardians.
40. (I take advice from my parents/guardians.)
22.- Teachers have to ask me to be quiet in class.
68. (I seek advice from my teachers and counselors.)

Integrity

78. I am trusted by my teachers.
41.- I cheat on assignments.
110.- If I do not complete an assignment, I will copy from a friend.
102. I am trusted by my friends.
97.-*I cheat on quizzes and tests if it is possible.
66.-*If it is possible I will copy from the teacher's answer key.

Autonomy and Responsibility

10. I can be depended on at home.
71. (I help to support myself through school.)
42. I make my own decisions about dating (when and where etc.).
115.- I go where I want whenever I want.
23. I enjoy doing extra activities for my school.
84. (I do my chores as quickly and thoroughly as possible.)
11. I like to lead out in club-related activities.
118. (I try to keep within my budget.)
31. (I participate in extracurricular activities.)
96. (I inform my parents/guardians as to my whereabouts.)
53. (If I return from school later than normal I report to my parents/guardians.)

Cognitive Skills

Concentration and Attentiveness

63.- I would rather draw irrelevant pictures in class than take lecture notes.
12.- My love life interferes with my attention to school work.
43. (I listen to everything the teacher says in class.)
90.- It is hard for me to concentrate in class.
24.- I am easily distracted from whatever I am doing.
85. (I am able to sustain attention to a task for over 30 minutes.)
52.- My mind wanders a great deal when I study.
32.- I am distracted from my studies very easily.
72.- I find it difficult to concentrate on my school work.
79.- I would rather look out the window than pay attention to the teacher.

Information Assimilation and Perspective

13. (I try to be well prepared for tests.)
116. (I stop periodically while reading and mentally go over or review what was said.)
98. (I try to find relationships between what I am learning and what I already know.)
64. (When I am studying a topic, I try to make everything fit logically.)
55. (When preparing for an exam, I create questions that I think might be included and study them.)
74.- I do poorly on tests because I find it hard to plan my work within a short period of time.

Literary Skills

33. *I like reading assignments.
14. I am up to date with my reading assignments.
65. I know how to find most things in the library.
107. *I like to read on topics outside of school work.
54. I know enough about the library to use it effectively.
111. *I read so that I could understand the subject matter.
73. I like to use the library.
44.-*Reading is a boring activity for me.

The two separate scales--the Study Skills scale and the Organization scale, were combined to form the "new" Organization and Study Skills scale, and the Persistence scale was renamed the Thoroughness and Persistence scale.

Item Analysis for the First Pilot Study

The 120-item instrument (DI-120) was first pilot tested on 74 students from two public schools and one private school in Berrien County. Item analysis was performed and this DI-120 yielded an alpha reliability coefficient of .8300. Items were successively removed until a 55-item instrument (DI-55/P1) resulted (**Step 5**).

Table 2 compares alpha reliability coefficients of the instruments of lengths 120, 85, 75, 63, and 55 items.

Table 3 provides the point-multiserial correlation coefficients of the items. The data for the items that were retained for initial the 55-item DI (DI-55/P1) are highlighted. Absent from the 55-item DI at this stage are data for items 24, 40, and 42. These three items replaced items 10, 26, and 111 from the initial 55-item inventory

(DI-55/P1). The replacements were 83, 5 and 101 for 24, 40, and 42 respectively (see Table 7). The numbers in parentheses in Table 3 represent the numbers in the last three versions of the instrument (DI-55/P2, DI-55/S, and DI-55/F), the numbers and content of the items being the same. These versions differed in that some items were reworded.

TABLE 2

A COMPARISON OF THE RELIABILITY COEFFICIENTS OF THE DI OF FIVE DIFFERENT LENGTHS FOR THE FIRST PILOT STUDY

Length of DI	Reliability Coefficient
120-Item	.8300
85-Item	.8960
75-Item	.9131
63-Item	.9185
55-Item	.9199

TABLE 3

POINT-MULTISERIAL CORRELATION COEFFICIENTS OF THE DILIGENCE INVENTORY OF FIVE DIFFERENT LENGTHS FOR THE FIRST PILOT STUDY

Item		120-item (DI-120)	85-item	75-item	63-item	55-item (DI-55/P1)	
1	**(20)**	**.2565**	**.3056**	**.3284**	**.3679**	**.3830**	
2		.1612					
3		-.0327					
4		.1321	.1326	.1412			
5		.3846	.4066	.4019	.1740		
6		-.0501					
7	**(18)**	**.1984**	**.1660**	**.1807**	**.2064**	**.2031**	
8	**(12)**	**.3020**	**.3266**	**.3426**	**.3716**	**.3680**	
9		-.2343					
10	*	.3528	.4345	.4817	.4993	.4839	*
11		.0192					
12		-.3860					
13	**(33)**	**.5119**	**.5402**	**.5402**	**.4715**	**.5157**	
14		.3738	.3909	.3864	.3765		
15		.2357	.1484	.1090			
16	**(8)**	**.3445**	**.3636**	**.3892**	**.3906**	**.4033**	
17	**(1)**	**.3402**	**.3802**	**.3454**	**.3567**	**.3719**	
18		-.0471					
19	**(17)**	**.5217**	**.6026**	**.5981**	**.5899**	**.6064**	
20	**(46)**	**.5199**	**.5646**	**.5788**	**.5595**	**.5818**	
21	**(6)**	**.2111**	**.2230**	**.2426**	**.2619**	**.2362**	
22		-.0990					
23		.1932	.2008	.1993	.2150		
24		.2241	.1927	.1565			
25	**(37)**	**.1372**	**.1521**	**.1650**	**.2187**	**.2144**	
26		.2694	.2051	.2041	.2216	.1879	
27		.2031	.1855	.1622			
28	**(23)**	**.6064**	**.6315**	**.5951**	**.5793**	**.5900**	
29		.1892	.1362	.1056	.0710		
30	**(50)**	**.3556**	**.4383**	**.4537**	**.4439**	**.4563**	
31	**(16)**	**.3854**	**.3734**	**.3564**	**.3588**	**.3532**	
32		.2180	.1626	.0974			
33		.1103	.0211				
34	**(2)**	**.3684**	**.3909**	**.4046**	**.3783**	**.3595**	
35	**(26)**	**.4204**	**.4521**	**.4357**	**.4361**	**.4565**	
36		-.0559					
37	**(55)**	**.4904**	**.5598**	**.5637**	**.5682**	**.5937**	
38		.1085	.0558				
39		.1195	.1235	.1686			
40	**(10)**	**.4598**	**.4669**	**.4635**	**.4621**	**.4421**	

TABLE 3--Continued

Item	120-item (DI-120)	85-item	75-item	63-item	55-item (DI-55/P1)
41	.0451				
42	.2526	-.2045	-.2223	.2888	
43 (3)	**.4607**	**.4607**	**.4823**	**.4592**	**.4494**
44	.0145				
45 (41)	**.3138**	**.3500**	**.3775**	**.3831**	**.4066**
46	.0657				
47	.0689				
48	.0320				
49	.0983				
50 (29)	**.3747**	**.4413**	**.4578**	**.4484**	**.4573**
51 (54)	**.4280**	**.4439**	**.4303**	**.4329**	**.4306**
52	.0807				
53 (39)	**.4911**	**.5550**	**.5709**	**.5835**	**.5879**
54 *	.3399	.3578	.3485	.3609 *	
55 (21)	**.2107**	**.3196**	**.3356**	**.3669**	**.3770**
56	.0055				
57	.2293	.1234	.0689		
58 (7)	**.3557**	**.3712**	**.3795**	**.3662**	**.3610**
59 (25)	**.4812**	**.5640**	**.5980**	**.6002**	**.6191**
60	.1533	.0579			
61	.4502	.5181	.5544	.0961	
62 (44)	**.6079**	**.6474**	**.6523**	**.6255**	**.6335**
63	.1714	.1063	.0447		
64 (15)	**.3622**	**.3929**	**.4266**	**.4427**	**.4424**
65 *	.3915	.3821	.3705	.3768 *	
66	.0475				
67 (45)	**.2487**	**.2455**	**.2759**	**.3051**	**.2792**
68 (34)	**.2757**	**.3403**	**.3834**	**.3993**	**.4029**
69	-.0431				
70 (32)	**.2813**	**.3633**	**.4034**	**.4262**	**.4476**
71 (52)	**.2714**	**.3356**	**.3829**	**.3972**	**.3854**
72	.1994	.0667			
73	.1604	.1765	.1796	.1792	
74	-.0459				
75 (38)	**.3490**	**.4251**	**.4587**	**.4630**	**.4582**
76 (53)	**.4171**	**.4000**	**.4186**	**.3898**	**.3783**
77	.1442	.0492			
78 *	.3384	.4276 *			
79	-.0040				
80 (30)	**.2546**	**.2824**	**.3113**	**.3672**	**.3318**

TABLE 3--Continued

Item		120-item (DI-120)	85-item	75-item	63-item	55-item (DI-55/P1)	
81	(43)	.3927	.4333	.4137	.3699	.4010	
82	(11)	.2557	.2847	.2823	.2829	.3116	
83		.1121	.0629				
84	(4)	.3114	.3656	.3973	.4095	.4077	
85	(48)	.4990	.5310	.5583	.5647	.5502	
86	(19)	.3579	.3876	.3756	.3643	.3713	
87		.1730	.1324	.0547			
88	(51)	.1513	.2395	.3031	.3221	.3347	
89		-.2854					
90		.0389					
91		.1280	.0223				
92	(13)	.2646	.3175	.3233	.3181	.3281	
93	(49)	.5463	.6574	.6845	.6733	.6934	
94		-.1871					
95	(28)	.4886	.5443	.5699	.5701	.5622	
96	(22)	.4998	.5532	.5825	.6031	.6001	
97		.0881					
98	(27)	.4678	.5159	.5414	.5711	.5703	
99		.1025	.0301				
100		.1395	-.1733				
101		-.1427					
102	*	.3839	.3997	.4229	*		
103	(5)	.6339	.6719	.6552	.6262	.6448	
104		.0621					
105		.0183					
106		.0253					
107		.0740					
108	(31)	.1109	.1800	.2110	.2144	.2161	
109		-.1700					
110		.1215					
111	*	.6164	.5927	.5737	.5628	.5592	*
112	(35)	.4000	.4034	.4042	.3885	.3859	
113	(36)	.2904	.2933	.3168	.3486	.3585	
114		-.0955					
115		-.0098					
116	(9)	.2958	.3638	.4033	.4477	.4399	
117		-.1769					
118	(47)	.2987	.3442	.3666	.3907	.3751	
119	(14)	.3277	.3829	.3904	.3784	.3881	
120		-.2012					

Although the eight items with asterisks in Table 3 have point-multiserial coefficients above .2500, they were not included in the last three versions of the inventory. Six of the items belonged to the Integrity scale and the Literary Skills scale, and these scales were eliminated. The other two items were eliminated when the Time Management scale and the Organization and the Study Skills scale were combined to form the "new" Time Management and Study Skills scale. The actual items from the 120-item DI that were retained for the 55-item inventories are shown in parentheses on pages 100 - 104.

The Motivation scale, the Thoroughness and Persistence scale, and the Discipline and Devotion scale were retained unaltered apart from eliminating items with point-multiserial correlation coefficients that did not meet the set criterion of .2500 and above. Item 75 from the Motivation scale and item 88 from the Thoroughness and Persistence scale were used in the Time Management and Study Skills scale because they related more to the content of that scale.

The items that were eliminated from the Motivation scale were: 3, 4, 18, 36, 49, 106, and 114. The items that were dropped from the Thoroughness and Persistence scale were: 6, 39, 46, 61, 69, 94, 99, and 117. The items that were dropped from the Discipline and Devotion scale were 29, 38, 60, 100, and 104.

The Integrity scale was dropped because it was felt

that too many of the items made judgment calls and the fact that four of the six items in the scale (41, 66 97, and 110) had point-multiserial correlation coefficients less than .1500. Only two other items (78 and 102) had point-multiserial coefficients that were above the criterion of .2500, as found in Table 3.

Items 10, 11, 23, 42, and 115 were eliminated from the Autonomy and Responsibility scale. The Conformity scale and the Autonomy and Responsibility scale were combined to form the Conformity and Responsibility scale. Items 10 and 42 had point-multiserial correlation coefficients greater than .2500. However, item 10 was dropped because item 84 was deemed to be more specific, and item 42 on "dating" was regarded as tangential to the theme of the scale. Items 9, 22, 89, and 109 were dropped from the Conformity scale because they did not meet the criterion.

Items from the scale Information Assimilation and Perspective scale were combined with items from the Concentration and Attentiveness scale to form the Concentration and Assimilation scale. Items 24, 32, 52, 63, 72, 79, and 90 were dropped from the Concentration and Attentiveness scale because the items had correlation coefficients less than .2500. Item 12 was eliminated because it related to the students' social life. Item 74 was the only one retained from the Information Assimilation

and Perspective scale because it did not satisfy the criterion of .2500.

The Literary Skills scale was eliminated because more than half of the items did not have qualifying point-multiserial correlation coefficients. The items involved were 14, 33, 44, 54, 65, 73, 107, and 111.

Upon eliminating 65 of the original 120 items it was discovered that a greater proportion of the already fewer negative items were sacrificed. (The ratio was 72 positive to 48 negative items). This fact and the need to achieve greater clarity led to the rewording of 19 items. Eleven of these items were rewritten negatively with respect to diligence. In all the changes, an attempt was made to preserve the content of each item as much as possible.

Following is a presentation by their respective scales of the items that were reworded. The first number relates to the 55-item instrument and the number in parenthesis is the original number from the 120-item DI. The signs of the items are indicated; the reworded items are highlighted.

Time Management and Study Skills

+51. (88) I can study for more than two hours at a time.
- I tend to fall asleep when I'm studying.

+53. (76) I try to study in a quiet place.
- I have difficulty in settling down to my studies at home.

Motivation

+ 7. (58) I am able to begin assigned tasks without prompting.
+ I am able to do my assignments without prompting.

-42. (101) I am satisfied with a "C" grade even though I could do "A" work on my assignments.
- When a subject is too difficult I settle for a passing grade.

Thoroughness and Persistence

+35. (112) I finish projects that I start.
- I start projects well but I have problems with completing them.

+40. (5) I take a lot of care when I do my assignments.
- I find it difficult to complete all my assignments.

Discipline and Devotion

+ 6. (21) I get adequate rest every day.
- I feel I'm not getting enough rest.

+12. (8) Nature appeals to me.
+ I take time to admire the things of nature.

+18. (7) I have a daily exercise program.
+ I follow an exercise routine to keep me mentally alert.

-24. (83) I tend to overeat.
- I have irregular eating habits.

+30. (80) I drink adequate water every day.
- I forget to drink adequate water every day.

+45. (67) I keep my weight under control.
+ I try to keep my weight under control.

Conformity and Responsibility

+10. (40) I take advice from my parents/guardians.
- I take more advice from friends than from my parents/guardians.

+22. (96) I inform my parents/guardians as to my whereabouts.
- I don't think it's necessary to inform my parents/guardians as to my whereabouts.

+28. (95) I try to cooperate with my teachers.
- It is not easy for me to cooperate with all my teachers.

Concentration and Assimilation

+ 9. (16) I stop periodically while reading and mentally go over or review what was said.
+ I stop periodically while reading and review the information.

+27. (98) I try to find relationships between what I am learning and what I already know.
+ I try to see the relationships between what I am studying and what I already know.

+33. (13) I try to be well prepared for tests.
- I find myself not prepared for tests as I would like.

+48. (85) I am able to sustain attention to a task for over 30 minutes.
- I find it difficult to sustain attention to my school work.

Six scales and 55 items resulted at this **Step 5** stage of the study as follows:

. Time Management and Study Skills

. Motivation

. Thoroughness and Persistence

. Discipline and Devotion

. Conformity and Responsibility

. Concentration and Assimilation

Following is a presentation of the items and their signs by their respective domains and scales. The items in parentheses reflect the changes that were made in Step 5 and the highlighted items were the changes made in Step 6.

The 55-Item DI by Domains and Scales

Industry

Time Management and Study Skills

2.+ I make constructive use of my leisure time.
8.- I have problems in taking class notes.

14.+ I review my notes before the next class.
20.- I like to relax with friends before I do my homework.
26.+ I like my assignments to look neat and tidy.
32.+ My friends see me as very organized for school.
38.+ I do my assignments as soon as I get them.
43.+ I try to turn in my home work assignments on time.
51.-(I tend to fall asleep when I'm studying.)
53.-(I have difficulty in settling down to my studies at home.)

Motivation

1.+ I want to do the best I can in school.
7.+(I am able to do my assignments without prompting.)
13.- I avoid extra credit assignments because they take too much of my time.
19.+ I like to take up academic challenges.
25.+ I set high standards for myself in school.
31.- I get upset for the amount of school work I have to do.
37.- I don't care for my parents to interfere in my school work.
42.-(When a subject is too difficult I settle for a passing grade.)
49.+ I try to do outstanding work in all my classes.
55.+ I work very hard to get good grades.

Thoroughness and Persistence

5.+ I take care to complete my assignments.
11.+ I proofread all assignments before turning them in.
17.+ I make sure that my assignments are done correctly.
23.+ I strive to do my assignments to the best of my ability.
29.+ I do not turn in an assignment until I am sure that it is correct.
35.-(I start projects well but I have problems with completing them.)
46.+ Even when I am tired I try to complete my assignments.
40.-(I find it difficult to complete all my assignments.)

Citizenship and Character

Discipline and Devotion

6.-(I feel I'm not getting enough rest.)
12.+(I take time to admire things in nature.)
18.+(I follow an exercise routine to keep me mentally alert.)
24.-(I have irregular eating habits.)
30.-(I forget to drink adequate water every day.)
36.+ I like to pray every day.

41.+ I enjoy attending church or religious services.
45.+(I try to keep my weight under control.)
54.+ I like to have quiet moments for reflection.

Conformity and Responsibility

4.- I wish I didn't have to do chores at home.
10.-(I take more advice from friends than from my parents/guardians.)
16.- I don't care to participate in extracurricular activities for my school.
22.-(I don't think it's necessary to inform my parents/guardians as to my whereabouts.)
28.-(It is not easy for me to cooperate with all my teachers.)
34.+ I seek advice from my teachers and counselors.
39.+ If I return from school later than normal I would offer an explanation to my parents/guardians.
44.+ I like to obey my teachers promptly.
47.+ I try to keep within my budget.
50.+ I try to obey my parents/guardians promptly.
52.+ I help to support myself through school.

Cognitive Skills

Concentration and Assimilation

3.+ I listen to everything the teacher says in class.
9.+(I stop periodically while reading and review the information.)
15.+ When I am studying a topic, I try to make all the ideas fit logically.
21.+ When preparing for an exam, I create questions that I that might be included and study them.
27.+(I try to see the relationships between what I am studying and what I already know.
33.-(I find myself not prepared for tests as I would like to.)
48.-(I find it difficult to sustain attention to my school work.)

Item Analysis for the Second Pilot Study

The 55 items in the DI were arranged on a similar basis as the original 120-item instrument. This version of the DI appears in Appendix F. A second pilot study was conducted using 33 students from another school. This led

to a further refinement; ten items were reworded resulting in DI-55/P2 (**Step 6**). Following is a presentation of these ten items with the revisions highlighted. In addition some minor changes were made in the demographics section (age and grade), and the Likert scale ranged from 1 to 5 instead of from 0 to 4. Appendix G presents the DI that resulted from the second pilot study.

Time Management and Study Skills

8. - I have problems in taking class notes.
   - I have problems with taking organized class notes.

20. - I like to relax with friends before I do my homework.
   + I do homework before I spend time with friends.

Motivation

13. - I avoid extra credit assignments because they take too much time.
   - I do not find time to do extra credit assignments.

37. - I don't care for my parents to interfere in my school work.
   - I don't like my parents to interfere in my school work.

Discipline and Devotion

36. + I like to pray every day.
   + Personally, I like to take a little time out to pray or meditate.

54. + I like to have quiet moments for reflection.
   + I like to have quiet moments to plan my strategies for success in school.

Conformity and Responsibility

16. - I don't care to participate in extracurricular activities for my school.
   + I like to participate in extracurricular activities for my school.

18. + I follow an exercise routine to keep me mentally alert.
   - I think I don't get enough exercise.

28. - It is not easy for me to cooperate with all my teachers.
    - **Some teachers think I give them a hard time.**

34. + I seek advice from my teachers and counselors.
    + **I seek feedback from my teachers and/or counselors concerning the progress I am making in school.**

Table 4 compares the point-multiserial correlation coefficients of the 55 items of the first and second pilot studies with those of the actual study. The changes in the values of the coefficients may be followed as items were reworded. The highlighted items were the ones affected.

Essentially, the revision associated with the second pilot study aimed primarily at increasing the number of negative statements with respect to diligence. Of the 19 items that were rewritten for this revision, only five had point-multiserial correlation coefficients that were less than .2500 (6, 18, 24, 40, and 42). Two of these five items (6 and 40) changed sign from positive to negative. Nine other items changed signs from positive to negative for a total of 11 items.

An examination of Table 4 shows that there was a fair degree of agreement between the point-multiserial correlation coefficients of the items for the first and second pilot tests. Although the sample for the second pilot test was much smaller than the sample for the first pilot test (33 compared to 74), 15 items showed some improvement.

TABLE 4

A COMPARISON OF THE POINT-MULTISERIAL CORRELATION COEFFICIENTS OF THE 55 ITEMS IN THE TWO PILOT TESTS AND THE FINAL VERSION OF THE INVENTORY

Item	First pilot (DI-120)	Second pilot (DI-55/P1)	Actual study (DI-55/P2)
1	.3719	.4622	.5644
2	.3595	.4088	.4284
3	.4494	.5428	.5131
4	.4077	**.3131**	(.2396)
5	.6448	.4629	.6653
6	**.2362**	.4763	(.2083)
7	**.3610**	.3014	.4617
8	.4033	**.2587**	.3553
9	**.4399**	.3633	.4021
10	**.4421**	.2398	.3022
11	.3116	.3311	.4294
12	**.3680**	.4785	.3026
13	.3281	.1504	*(.1176)
14	.3881	**.1954**	.2537
15	.4424	.4499	.5042
16*	.3532	**.0926**	.3398
17	.6064	.6113	.5980
18	**.2031**	.1865	(.2173)
19	.3713	.4925	.5562
20	.3830	**.1894**	.6661
21	.3770	.3659	.4807
22	**.6001**	.4675	.2910
23	.5900	.7639	.6241
24 (83)	**----**	.3482	.3273
25	.6191	.6805	.6402
26	.4565	.4589	.4700
27	**.5703**	.4170	.5073
28	**.5622**	**.1521**	.4009
29	.4573	.4081	.5069
30	**.3313**	.2287	*(.1614)
31	.2161	.4718	*(.1490)
32	.4476	.5346	.5401
33	**.5157**	.4615	.4079
34*	.4029	**.0408**	.3581
35	**.3859**	.3039	.3892
36*	.3585	**-.0708**	(.2195)
37*	.2144	**.0081**	*(.1885)
38	.4582	.3920	.5295
39	.5879	.2648	.4078

TABLE 4--Continued

Item	First pilot (DI-120)	Second pilot (DI-55/P1)	Actual study (DI-55/P2)
40 (5)	**-----**	.1957	.3086
41	.4066	.2564	.3949
42 (101)	**-----**	.3308	.4829
43	.4010	.3760	.4446
44	.6335	.5581	.5115
45	**.2792**	.1572	(.2258)
46	.5818	.5161	.5737
47	.3751	.4050	.3746
48	**.5502**	.4920	.4868
49	.6934	.6201	.6806
50	.4563	.5656	.5292
51	**.3347**	.2172	.3384
52	.3854	.4854	*(.1139)
53	**.3783**	.1473	.4498
54*	.4306	**-.0072**	.4174
55	.5937	.5814	.6423

Of the 40 items that experienced a decline in correlation coefficient in going from the first to the second pilot, 10 items (highlighted under "Second pilot") that had the largest changes were reworded. Five of these 10 items (16, 34, 36, 37, and 54 identified by asterisks) were cause for more serious concern. But it was determined that the small sample size and the fact that the sample came from one school may have contributed to this anomalous situation. As it turned out, sizeable improvements in correlation coefficients were evident for all five items in the actual study.

Four other items (14, 45, 51, and 53) showed moderate declines in point-multiserial correlation

coefficients in going from the first to the second pilot study. Three of these items also showed substantial improvements in the actual study. Item 45 fell slightly below the criterion of .2500.

A comparison of the point-multiserial correlation coefficients of the items for the second pilot test and those of the actual study reveals that 38 items showed improvements. Ten items in the actual study had values less than .2500 (in parentheses in Table 4), five of these had values less than .2000 (with asterisks) and were considered for elimination.

Table 5 presents statistical summaries for the 55-item DI for the two pilot studies. The lower reliability coefficient for the second pilot test is a reflection of the much smaller sample and perhaps sample peculiarities.

Item Analysis of the DI for the Actual Study

The instrument that was used for the actual study and the instructions for its administration are presented in Appendix G. The reliability of the 55-item DI was .9021. The point-multiserial correlation coefficients of the items are already presented in Table 4. Ten items (in parentheses) had point-multiserial correlation coefficients less than .2500, five of which (with asterisks) were less than .2000. The ten items with the five items with values less than .2000 highlighted are presented by scales as follows:

TABLE 5

A COMPARISON OF THE STATISTICAL SUMMARIES FOR THE 55-ITEM DILIGENCE INVENTORY FOR THE FIRST AND SECOND PILOT STUDIES

	First pilot	Second pilot
Number of subjects	74	33
Maximum score range	0 - 220	0 - 220
Actual score range	38 - 140	84 - 143
Mean	99.892	114.371
Standard deviation	21.859	16.269
Standard error of the mean	2.558	2.790
Reliability coefficient	.9199	.8886
Standard error of measurement	6.1883	6.5355
The probability is .95 that an individual's true score is within * above or below his observed score	* 12.1291	*12.8096

Motivation

13. I do not find time to do extra credit assignments.

31. I get upset over the amount of school work I have to do.

37. I don't like my parents to interfere in my school work.

Discipline and Devotion

6. I feel I am not getting enough rest.

18. I think I don't get enough exercise.

30. I forget to drink adequate water.

36. Personally, I like to take a little time out to pray or meditate.

45. I try to keep my weight under control.

Conformity and Responsibility

4. I wish I didn't have to do chores at home.

52. I help to support myself through school.

Removing these five items successively produced no substantial increase in reliability as shown in Table 6. This justified retaining these items in order to maintain the content validity of the instrument. The reluctance to eliminate any items also was influenced by the relatively small sample (237) for a study of this nature. Table 7 presents a statistical summary of the results of the item analysis for the actual study.

TABLE 6

A COMPARISON OF RELIABILITY COEFFICIENTS OF THE DI OF SIX DIFFERENT LENGTHS

Length of DI	Item eliminated	Reliability Coefficient
55 Items		.9021
54 Items	52	.9048
53 Items	13	.8875
52 Items	31	.9074
51 Items	30	.9093
50 Items	37	.9003

TABLE 7

STATISTICAL SUMMARY FOR THE FINAL
55-ITEM DILIGENCE INVENTORY

	Final DI
Number of subjects	237
Maximum score range	55 - 275
Actual score range	69 - 197
Mean	129.485
Standard deviation	25.760
Standard error of the mean	1.677
Reliability coefficient	.9021
Standard error of measurement	8.0581

The probability is .95 that an individual's true score is within 15.7939 above or below his observed score.

Item Analysis of the Six Scales

Item analysis was performed on each suggested scale. (This is still part of **Step 7**). Table 8 presents the reliability coefficient of each scale and the point-multiserial correlation coefficients of the items in each scale.

The Discipline and Devotion scale yielded a relatively low reliability coefficient of .2903, although the point-multiserial correlation coefficients of all but item 18 fell within an acceptable range of .3301 to .5801.

All the other five scales yielded reliability

TABLE 8

RELIABILITY COEFFICIENTS OF THE SIX SCALES AND POINT-MULTISERIAL CORRELATION COEFFICIENTS OF THE ITEMS IN EACH SCALE

Scales	Item Point-multiserial Correlation	Scale Reliability Coefficient
Time Management & Study Skills		.4451
2	.3709	
8	.5630	
14	.2885	
20	.3224	
26	.5554	
32	.6189	
38	.5735	
43	.5058	
51	.5003	
53	.5389	
Motivation		.7180
1	.6569	
7	.5196	
13	**.2403**	
19	.6399	
25	.7032	
31	.2990	
37	.3487	
42	.6330	
49	.7380	
55	.6656	
Thoroughness & Persistence		.7473
5	.7261	
11	.5741	
17	.7199	
23	.7255	
29	.6086	
35	.4428	
40	.4407	
46	.6387	

TABLE 8--Continued

Scales	Item Point-multiserial Correlation	Scale Reliability Coefficient
Discipline & Devotion		**.2903**
6	.3780	
12	.4022	
18	**.0421**	
24	.3652	
30	.3594	
36	.5764	
41	.5801	
45	.3301	
54	.4411	
Conformity & Responsibility		.5482
4	.2899	
10	.3850	
16	**.0884**	
22	.4294	
28	.5725	
34	.3282	
39	.5650	
44	.5562	
47	.5437	
50	.6236	
52	.4120	
Concentration & Assimilation		.6771
3	.5212	
9	.5852	
15	.6201	
21	.6455	
27	.6755	
33	.5085	
48	.5377	

coefficients ranging from .4451 to .7473, which were reasonable for scales of such lengths. The point-multiserial correlation coefficients fell within an acceptable range of .2885 and .7380, with the exception of items 13 and 16 from the Motivation scale, and the Conformity and Responsibility scale. At this stage there was reason to suggest that at least five of the scales had acceptable reliabilities with the Discipline and Devotion scale somewhat suspect.

Factor Analysis of the 55-Item DI

Factor analysis is usually used in exploratory data analysis in order to seek out plausible underlying dimensions of a particular construct. However, in this study it was used more in a confirmatory manner, to determine if indeed the number and composition of scalesthat resulted from the item-analysis refinement process would hold up in the factor structure (**Step 8**). It must be emphasized that because of the limitation in sample size, the results were interpreted cautiously.

Since six scales were developed, it was decided that a logical number of factors with which to begin factor extraction was six. Negative items with respect to diligence were reversed to avoid negative correlations of the variables with the factors. In order to facilitate the naming and interpretation of factors, the negative items

were actually reworded to reflect the reversal of the scaling as shown in Tables 11 to 14.

The method of extraction was principal components. An oblique method of rotation was used because it was assumed that the factors were correlated. The direct oblimin method of rotation with gamma set at 0.0 was used. A value of 0.0 was considered to be conservative since it produces a solution with factors that are not correlated quite so highly as a positive value (Gorsuch, 1983).

Six, five, four, and three factors were rotated. Upon analyzing the results, the five-factor solution was favored above the rest since it produced the least overlap of variables on the factors, and the groupings of the variables made the most sense as far as the contents of the scales were concerned. At least this result seemed to be consistent with the item-analysis procedure that turned out five reliable scales of the six.

The five factors had eigenvalues ranging from 10.98 to 1.86 and accounted for 37% of the variance in diligence. The communalities and factor loadings of the items are presented in Table 9. The communality of a variable gives an indication of the reliability and validity of the variable in the instrument. Communalities and factor loadings of .30 and above were considered acceptable. (Child, 1979).

Fourteen items had communalities below .30, six of which were considered borderline. However, all but four of

TABLE 9

COMMUNALITIES AND ROTATED FACTOR LOADINGS
OF THE ITEMS ON FIVE FACTORS

Item	Communality h^2	Factor Loading I	II	III	IV	V
25	.62	.735				
49	.61	.700				
1	.51	.688				
42	.47	.654				
55	.55	.608				
43	.46	.602				
23	.51	.595				
5	.53	.544				
17	.46	.512				
16	.25	.504				
19	.54	.460	.437			
8	.26	.445				
40	.34	.430				
7	.27	.429				
32	.34	.406				
33	.46	.366			.497	
48	.32	.347				
38	.36	.319				
46	.38	.309				
14	.34		.574			
9	.36		.523			
21	.42		.512			
27	.44		.511			
11	.34		.510			
15	.42	.311	.448			
29	.35		.421			
34	.31		.369			
28	.40			.600		
44	.47			.556		
50	.46			.543		
39	.45			.523		
47	.27			.480		
22	.28			.385		
37	.19			.384		
20	.54			.336		
3	.35			.324		
26	.29	.317		.317		
10	.23			.296		
52	.19			.294		

TABLE 9-Continued

Item	Communality h^2	Factor Loading I	II	III	IV	V
24	.43				.626	
6	.27				.506	
31	.33				.504	
13	.22				.437	
51	.27				.424	
30	.17				.413	
35	.29	.303			.361	
18	.18				.268	
36	.52					.740
41	.40					.597
12	.30					.502
2	.35					.488
54	.40		.375			.464
4	.30					.455
53	.46					.406
45	.13					.282

these items had acceptable factor loadings. The four items (10, 18, 45, and 52) were considered for possible elimination but it was speculated that with a larger sample they might show some improvement. For this reason it was decided to retain all the items for this study.

Table 10 is a factor correlation matrix showing the moderate correlation coefficients between the factors. Very obvious is the fact that factor I (Motivation) correlates with all the other factors, which is not surprising. Also understandable are the rather low correlations between factors II and IV (Concentration and Assimilation, and Discipline), between factors III and IV (Devotedness and Spirituality, and Discipline), and between factors IV and V (Discipline, and Devotedness and Spirituality).

TABLE 10

CORRELATION MATRIX FOR THE FIVE ROTATED FACTORS

	Factors				
	I	II	III	IV	V
Factor I	1.000				
Factor II	.174	1.000			
Factor III	.227	.142	1.000		
Factor IV	.177	-.010	.094	1.000	
Factor V	.296	.162	.149	.092	1.000

Tables 11 through 15 present the items and their factor loadings for each of the five factors. Since the composition of the factors changed, Table 16 compares the reliabilities of the scales (factors) and the point-multiserial correlation coefficients of the items in the scales from the item-analysis solution with those of the factor-analysis solution. Another revision was undertaken to rearrange the composition of the scales of the inventory (DI-55/F in Table 1).

This revision did not affect the number or content of the items but affected the number and composition of the scales. Each factor (scale) is now discussed to show the salient changes and the rationale for choosing the factor-analysis scales over the item-analysis counterparts.

The composition of the scales was not affected to the extent that the scales had to be renamed, although some slight modifications were made. The items that comprise the 6-scale instrument (DI-55/S in Table 1) are highlighted in Tables 11 through 16. Wherever the scaling of negative items were reversed they were reworded accordingly. Such items are identified by asterisks in tables 11 through 15.

Since there were now five scales instead of six, at least one scale had to be dropped. As it turned out, two scales were eliminated and the items from those scales were redistributed by the factor analysis. One scale was divided and the items formed the basis for two scales, thus accounting for the five scales.

The items from the Thoroughness and Persistence scale were dispersed through three scales, and the items from the Time Management scale and the Study Skills scale were dispersed through all five scales. The Discipline and Devotion scale was split and the items were applied to two related scales--the Discipline scale and the Devotedness and Spirituality scale. These changes may be followed in Table 16; original scales are in parentheses.

Factor I: Motivation

The Motivation scale which had ten items in the item-analysis scale gained nine more items from the five other scales. All the nine "new" items also related to motivation and the name was retained. The factor loadings of the items for the Motivation scale ranged from .309 to .735 as shown in Table 11. Five items were rewritten positively with respect to diligence (8, 33, 40, 42, and 48).

Factor II: Concentration and Assimilation

Factor II (Table 12) corresponds to the item-analysis Concentration and Assimilation scale which has seven items. The "new" scale has 8 items, 4 of which belonged to the original scale. The other four items did not alter the general content of the scale and the name was retained. The factor loadings for this scale ranged from

TABLE 11

ITEMS AND LOADINGS FOR FACTOR I: MOTIVATION

Item #	Item	Loading
25	**I set high standards for myself in school**	**.735**
49	**I try to do outstanding work in all my classes**	**.700**
1	**I want to do the best I can in school**	**.688**
42*	**When a subject is too difficult I do not settle for just a passing grade**	**.654**
55	**I work very hard to get good grades**	**.608**
43	I try to turn in my home work assignments on time	.602
23	I strive to do my assignments to the best of my ability	.595
5	I take care to complete my assignments	.544
17	I make sure that my assignments are done correctly	.512
16	I like to participate in extracurricular activities for my school	.504
19	**I like to take up academic challenges**	**.460**
8*	I have no problems with taking organized class notes	.445
40*	I do not find it difficult to complete all my assignments	.430
7	**I am able to do my assignments without prompting**	**.429**
32	My friends see me as very organized for school	.406
33*	I find myself prepared for tests as I would like	.366
48*	I do not find it difficult to sustain attention to my school work	.347
38	I do my assignments as soon as I get them	.319
46	Even when I'm tired I try to complete my assignments	.309

TABLE 12

ITEMS AND LOADINGS FOR FACTOR II:
CONCENTRATION AND ASSIMILATION

Item Number		Factor Loading
14	I review my notes before the next class	.574
9	I stop periodically while reading and review the information	.523
21	When preparing for an exam, I create questions that I think might be included and study them	.512
27	I try to see the relationships between what I am studying and what I already know	.511
11	I proofread assignments before turning them in	.510
15	When I am studying a topic, I try to make all the ideas fit logically	.448
29	I do not turn in an assignment until I am sure it is correct	.421
34	I seek feedback from my teachers and/or counselors concerning the progress I am making in school	.369

.369 to .574. These items were all positive with respect to diligence.

Factor III: Conformity and Responsibility

The items and factor loadings for factor III are presented in Table 13. This factor corresponds to the item-analysis Conformity and Responsibility scale with 12 items. Eight of the 12 items were retained and the other four items did not warrant a change of name for the scale . The factor loadings ranged from a borderline .294 to .600. Items 10, 22, 28, and 37 were rewritten positively with respect to diligence.

Factor IV: Discipline

Factors IV and V were both derived from the item-analysis Discipline and Devotion scale with nine items and each has elements of discipline and devotion, respectively. Factor IV (named Discipline) with eight items, has four of the nine items from the parent scale. The items and factor loadings for factor IV are presented in Table 14. The factor loadings for the items in factor IV range from .268 to .626. Item 18 is the only one with a loading below .30. This entire scale was negative and all the items were rewritten positively with respect to diligence.

TABLE 13

ITEMS AND LOADINGS FOR FACTOR III:
CONFORMITY AND RESPONSIBILITY

Item Number		Factor Loading
28*	**Teachers don't think that I give them a hard time**	**.600**
44	**I like to obey my teachers promptly**	**.556**
50	**I obey my parents/guardians promptly**	**.543**
39	**If I return from school later than normal I would offer an explanation to my parents/guardians**	**.523**
47	**I try to keep within my budget**	**.480**
22*	**I think it's necessary to inform my parents/guardians as to my whereabouts**	**.385**
37*	I like my parents to interfere in my school work	.384
20	I do homework before I spend time with friends	.336
3	I listen to everything the teacher says in class	.324
26	I like my assignments to look neat and tidy	.317
10*	**I do not take more advice from friends than from my parents/guardians**	**.296**
52	**I help to support myself through school**	**.294**

TABLE 14

ITEMS AND LOADINGS FOR
FACTOR IV: DISCIPLINE

Item Number	Item	Factor Loading
24*	**I have regular eating habits**	**.626**
6*	**I think I get enough rest**	**.506**
31*	I do not get upset over the amount of school work I have to do	.504
13*	I can find time to do extra credit assignments	.437
51*	I do not fall asleep when I'm studying	.424
30*	**I remember to drink adequate water**	**.413**
35*	I finish projects that I start	.361
18*	**I think I get enough exercise**	**.268**

Factor V: Devotedness and Spirituality

Factor V (named Devotedness and Spirituality) with eight items, has five of the nine items from the parent scale. The factor loadings for the items ranged from .282 to .740. One item (45) had a value below .30. Items 4 and 53 were rewritten positively with respect to diligence as shown in Table 15.

TABLE 15

ITEMS AND LOADINGS FOR FACTOR V:
DEVOTEDNESS AND SPIRITUALITY

Item Number	Item	Factor Loading
36	**Personally, I like to take a little time out to pray or meditate**	**.740**
41	**I enjoy attending church or religious services**	**.597**
12	**I take time to admire the things of nature**	**.502**
2	I make constructive use of my leisure time	.488
54	**I like to have quiet moments to plan my strategies for success in school**	**.464**
4*	I like to have to do chores at home	.455
53*	I don't have difficulty in settling down to my studies at home	.406
45	**I try to keep my weight under control**	**.282**

Item Analysis of the Five-Scale DI

Item analysis was performed on all the newly constituted scales (**Step 9**). An examination of Table 16 shows that the alpha reliability coefficients of all the scales improved considerably, and the point-multiserial correlation coefficients of all the items that had very low or moderately low values (4, 13, 14, 16, 18, and 31) improved significantly. These new scales had no correlation coefficients that were less than .30.

TABLE 16

A COMPARISON OF POINT-MULTISERIAL CORRELATION COEFFICIENTS OF THE 55 ITEMS OF THE FIVE FACTORS WITH THE CORRESPONDING ITEMS OF THE SIX ITEM ANALYSIS SCALES

Legend for the Item Analysis Scales:

CA -- Concentration and Attentiveness
CR -- Conformity and Responsibility
DD -- Discipline and Devotion
M -- Motivation
TMS -- Time Management and Study Skills
TP -- Thoroughness and Persistence

Factor/Items	Point-multiserial Correlation (Factor Analysis)	Point-multiserial Correlation (Item Analysis)
Motivation	**.8893***	**.7180***
1	**.6889**	**.6569 (M)**
5	.6957	.7261 (TP)
7	**.5115**	**.5196 (M)**
8	.4273	.5630 (TMS)
16	.4390	.0884 (CR)
17	.6267	.7199 (TP)
19	**.5825**	**.6399 (M)**
20	.6914	.3224 (TMS)
25	**.7432**	**.7032 (M)**
32	.5828	.6189 (TMS)
33	.4531	.5085 (CA)
38	.5406	.5735 (TMS)
40	.4241	.4407 (TP)
42	**.6162**	**.6330 (M)**
43	.5581	.5058 (TMS)
46	.5793	.6387 (TP)
48	.5166	.5377 (CA)
49	**.7743**	**.7380 (M)**
55	**.7218**	**.6656 (M)**

* Alpha reliability coefficient of the scale

TABLE 16--Continued

Factor/Items	Point-multiserial Correlation (Factor Analysis)	Point-multiserial Correlation (Item Analysis)
Concentration & Assimilation	**.7492***	**.6771***
9	**.5724**	**.5852 (CA)**
11	.6314	.5741 (TP)
14	.5579	.2885 (TMS)
15	**.6380**	**.6201 (CA)**
21	**.6447**	**.6455 (CA)**
27	**.6525**	**.6755 (CA)**
29	.6052	.6086 (TP)
34	.5340	.3282 (CR)
Conformity & Responsibility	**.7312***	**.5482***
3	.4840	.5212 (CA)
10	**.4255**	**.3850 (CR)**
20	.6250	.3224 (TMS)
22	**.4586**	**.4294 (CR)**
26	.4871	.5554 (TMS)
28	**.6043**	**.5725 (CR)**
37	.3835	.3487 (M)
39	**.5870**	**.5650 (CR)**
44	**.6132**	**.5562 (CR)**
47	**.5352**	**.5437 (CR)**
50	**.6368**	**.6236 (CR)**
52	**.3206**	**.4120 (CR)**

TABLE 16--Continued

Factor/Items	Point-multiserial Correlation (Factor Analysis)	Point-multiserial Correlation (Item Analysis)
Devotedness & Spirituality	**.6253***	**.2903***
2	.5458	.3709 (TMS)
4	.5115	.2899 (CR)
12	**.5161**	**.4022 (DD)**
36	**.6187**	**.5764 (DD)**
41	**.6215**	**.5801 (DD)**
45	**.3650**	**.3301 (DD)**
53	.5040	.5389 (TMS)
54	**.5279**	**.4411 (DD)**
Discipline	**.5582***	**.2903***
6	**.4958**	**.3780 (DD)**
13	.3620	.2403 (M)
18	**.4435**	**.0421 (DD)**
24	**.6796**	**.3652 (DD)**
30	**.5447**	**.3594 (DD)**
31	.4431	.2990 (M)
35	.4929	.4428 (TP)
51	.4694	.5003 (TMS)

Construct Validation of the DI

It was not possible to determine whether the instrument had construct validity from the two pilot studies because too few students were clasified by teachers on diligence. Data was obtained for 21 students in the first pilot and 17 students in the second pilot. In both instances the students seemed to belong to rather

homogeneous groups on diligence. With such limited variance, attempting to determine validity by the Known-Group difference method was a futile exercise.

The only recourse was to use the data for the actual study to establish construct validity. At that stage the DI was not final, but it was validated at what was considered to be an advanced stage of its development. Full details are presented in chapter 5.

Revised Operational Definition of Diligence

Rationale

Since the number of scales was reduced from 12 in the original definition to five, it is necessary to revise the definition of diligence to reflect this change. It is discovered that the original domains have been radically altered and what remains of them shows considerable overlap as the items in the scales have been rearranged. The revised definition, therefore, omits the three domains of Industry, Citizenship and Character, and Cognitive Skills. Diligence is defined by the five scales and the 55 items.

Definition of Diligence

Diligence in a student is defined as an expression or reflection of the effort expended toward balanced or holistic development by the student in the mental, physical, social, and spiritual dimensions, as indicated through measurement by the following scales:

1. Motivation

2. Concentration and Assimilation
3. Conformity and Responsibility
4. Discipline
5. Devotedness and Spirituality

Definition of Scales

Motivation--Drive to get started along a certain course of action with an intended result in mind.

Concentration and Assimilation--the act of focusing attention on a problem, task, or impending situation through a process by which all new experience, when received into the consciousness, is modified so as to be incorporated with the results of previous processes and the interaction in which a subject or its parts are mentally conceived.

Conformity and Responsibility--the act of maintaining harmony or the status quo in an organized setting by demonstrating maturity with respect to dealing with one's self and significant others.

Discipline--the training of the will.

Devotedness and Spirituality--practices that contribute to building good morals and self-esteem.

Summary

This chapter detailed the development of the Diligence Inventory using item analysis and factor analysis. Six scales emerged from the item-analysis procedure, five of which had acceptable alpha reliability

coefficients. Five factors were rotated for the same 55 items in the DI. A revised operational definition based on the five factors (scales) and the 55 items, was presented.

CHAPTER V

FINDINGS AND THE DEVELOPMENT OF A REGRESSION MODEL

Introduction

The purpose of this study was to develop a diligence inventory aimed at explaining and predicting competence (measured by GPA) in combination with ability (measured by ACT, PSAT, or SAT). Demographic differences in diligence among students were also investigated.

This chapter reports on the development of the Diligence Inventory followed by the testing of the hypotheses for developing the regression models and for investigating the demographic differences in diligence.

Description of the Population and Sample

The 11 private and 47 public schools in the five southwestern Michigan counties were placed in four enrollment categories: size A (299 and below), size B (300 - 499), size C (500 - 799), and size D (800 and over). An attempt was made to select a stratified random sample from 12 to 14 schools that would be representative of the juniors and seniors who attended the 58 schools.

As it turned out, five out of a possible 11 schools that agreed to participate in the study returned responses.

Therefore, the sub-population to which generalizations were made consisted of all the juniors and seniors who attended these five participating schools.

The sample consisted of 250 students. This number was reduced to 237 on discarding 13 responses that were either incomplete or spoiled. Each of the five counties was represented by a single school. Each enrollment category had one school except for size-A which had two schools. One of the size-A schools was private and the other was public. The three other schools were public schools.

The sample totals for the descriptions that follow fluctuate because of missing data in some variables. There were 98 (42%) juniors and 134 (58%) seniors; 129 (56%) were female and 102 (44%) were male. The majority of students (93%) were white as presented in Table 20. Tables 17 through 20 present more detailed breakdowns of the sample by age groups, gender, socioeconomic levels, and ethnic backgrounds, respectively. The breakdown by grades is also included in each table.

TABLE 17

COMPOSITION OF THE SAMPLE BY GRADE AND AGE GROUPS
(PERCENTAGES ARE IN PARENTHESES)

Age groups	Junior	Senior	Total
Under 16Y	71 (76)	6 (5)	77 (34)
16Y - 17Y 5M	17 (18)	54 (41)	71 (31)
17Y 6M and over	6 (6)	72 (55)	78 (35)
Sample Totals	94 (42)	132 (58)	226 (100)

TABLE 18

COMPOSITION OF THE SAMPLE BY GRADE AND GENDER
(PERCENTAGES ARE IN PARENTHESES)

Gender	Junior	Senior	Total
Female	61 (64)	67 (50)	128 (54)
Male	35 (36)	67 (50)	102 (46)
Sample Totals	96 (41)	134 (59)	230 (100)

TABLE 19

COMPOSITION OF THE SAMPLE BY GRADE AND SOCIOECONOMIC LEVEL
(PERCENTAGES ARE IN PARENTHESES)

Socioeconomic Level	Junior	Senior	Total
Under 25,000	17 (19)	27 (22)	44 (20)
25,000-39,999	44 (48)	43 (34)	87 (40)
40,000-59,999	18 (20)	32 (26)	50 (23)
60,000 and over	12 (13)	23 (18)	35 (16)
Sample Totals	91 (42)	125 (58)	216 (100)

TABLE 20

COMPOSITION OF THE SAMPLE BY GRADE AND ETHNIC BACKGROUND
(PERCENTAGES ARE IN PARENTHESES)

Ethnic Background	Junior	Senior	Total
Minorities	8 (8)	8 (6)	16 (7)
White	87 (92)	124 (94)	211 (93)
Sample Totals	95 (42)	132 (58)	227 (100)

Testing of the Hypotheses

Introduction

The statistical results presented in this section relate to the testing of the ten hypotheses for the study. In the following report of the results, each null hypothesis is stated followed by the findings for that hypothesis. Hypothesis one deals with the construct validation of the DI; hypotheses 2 through 6 investigate the correlations between diligence, ability, and competence; and hypotheses 7 through 10 investigate the demographic differences in diligence.

Construct Validation of the DI

Hypothesis 1 relates to the establishment of construct validity of the DI by the method of Known-Group difference. For this procedure, teachers classified students into three levels of diligence--low, average, and high. This hypothesis investigated whether these groups differed significantly in their actual diligence means. A significant difference in the right direction would mean that the DI was measuring the construct diligence as it should.

In this study the ability measures submitted by the school personnel consisted of the composite ACT and verbal and quantitative PSAT scores. It was therefore necessary to convert PSAT and SAT scores to an ACT equivalent in order to have a single scale for testing the hypotheses.

Tables 40 and 41 in Appendix I made the conversions possible. It might be instructive to note that the correlation (.38) between students' actual diligence scores and the diligence classifications made by teachers is significant at the .001 level.

Hypothesis 1: There is no significant difference in diligence (as measured by the DI) between the three groups of students that teachers subjectively classify as having low, average, and high diligence.

Table 21 presents the ANOVA table for diligence by teacher-classifications of diligence. The null hypothesis is not retained. Differences between the means of the groups are significant at a probability level less than .0001. A significant difference in diligence exists between the three groups of students that the teachers classified as having low, average, and high diligence.

Since there were three groups, the Newman-Keuls test was applied to determine the pairs of the three groups that were statistically different from each other. Table 22 presents the means for the groups and shows that a significant different exists between the groups in all three combinations of pairs.

The low group actually scored significantly lower than the average group which in turned scored lower than the high group. The means indicate that the groups are about evenly separated on diligence as shown in Table 23.

TABLE 21

ONE WAY ANOVA TABLE OF DILIGENCE
BY TEACHER CLASSIFICATIONS OF DILIGENCE

Source	df	Sum of Squares	Mean Square	F ratio	P
Diligence groups	2	24525.90	1262.95	22.66	.0000*
Error	202	109287.20	541.03		

* Significant at the p < .0001 level

TABLE 22

NEWMAN-KEULS COMPARISON OF MEANS ON DILIGENCE
FOR THE THREE TEACHER-CLASSIFIED GROUPS

Diligence Classification	Mean	#	Group Number 1	2	3
Low	169.7	1	--		
Average	181.8	2	*	--	
High	198.3	3	*	*	--

* Means significantly different at the p < .05 level

TABLE 23

STATISTICAL SUMMARY OF TEACHER-CLASSIFIED GROUP DIFFERENCES IN DILIGENCE

Diligence Classification	N	Mean	Stand. Deviation	Stand. Error	Minimum Score	Maximum Score
Low	43	169.7	17.32	2.64	129.00	200.00
Average	84	181.8	25.07	2.73	129.00	250.00
High	78	198.3	24.04	2.72	145.00	252.00

It can be stated that the DI seems to have construct validity, at least for the sub-population under study, since it successfully differentiates students of low diligence from those of average diligence, and students of average diligence from the very diligent students.

Zero-order Correlations

Table 24 consists of a matrix of correlation coefficients for ability (measured by ACT), competence (measured by semester GPA), diligence (measured by the DI) and cumulative GPA. This information pertains to hypotheses 2, 3, and 4. The correlation coefficients between achievement (cumulative GPA) and the other three variables are not needed for any of the three hypotheses but are useful for making comparisons with the more short-term competence measure (semester GPA).

TABLE 24

MATRIX OF CORRELATION COEFFICIENTS FOR ABILITY, COMPETENCE, DILIGENCE, AND ACHIEVEMENT

Variable	Ability	Competence	Diligence	Achievement
Ability	1.00			
Competence	.53*	1.00		
Diligence	.06	.32*	1.00	
Achievement	.63*	.89*	.27*	1.00

* Significant r at the $p < .001$ level

The correlation coefficient between ability and competence (.54) is somewhat smaller than that between ability and cumulative GPA (.63), although both correlation coefficients are highly significant. This is to be expected as ability and cumulative GPA are considered to be more stable measures than the short-term semester GPA which is subject to fluctuations. The two GPAs are highly correlated (.89), as one would expect. Also of interest is the fact that diligence correlates slightly higher (.32) with competence than with cumulative GPA (.27).

Hypothesis 2: There is no significant correlation between students' diligence and ability scores.

The zero-order correlation between diligence and ability is .06 (N = 140). This value is not statistically significant and for practical purposes the correlation is

considered to be zero. The null hypothesis is therefore retained. There is no significant correlation between students' diligence and ability scores as measured by the ACT or its equivalent.

Hypothesis 3: There is no significant correlation between students' ability and competence scores.

The zero-order correlation between students' ability and competence scores as measured by semester GPA is .54, significant at the .001 level (N = 151). The null hypothesis is not retained. There is a significant zero-order correlation between students' ability as measured by ACT or its equivalent and students' semester GPA.

Hypothesis 4: There is no significant correlation between students' diligence and competence scores.

The zero-order correlation between students' diligence and competence scores as measured by semester GPA is .32, significant at the .001 level (N = 151). The null hypothesis is not retained. There is a significant zero-order correlation between diligence and competence as measured by semester GPA.

Regression Models for Predicting Competence

The percentage of variance in competence that can be explained by each of the independent variables acting alone may be determined by squaring the zero-order correlation coefficient for each variable. For example, if

the correlation coefficient between ability and competence is .53 and that between diligence and competence is .32, this means that 29% of the variance in competence may be explained by ability alone, and 10% of the variance in competence may be explained by diligence.

Multiple-regression models are interested in predicting or explaining a dependent variable from a set of predictors. Of interest in this case is the prediction of competence, the dependent variable from both diligence and ability.

The objective is to explain as much variance as possible in the dependent variable by carefully selected predictors. Usually the greater the number of variables that correlate significantly with the dependent variable, the greater is the variance explained up to a point of diminishing returns. This is why the variance in competence explained by the five individual scales of diligence acting together with ability is of interest in this study.

In multiple regression the total variance explained by a set of predictors is not the arithmetic sum of their individual contributions. So one cannot say that the variance in competence explained by diligence and ability acting together is 39% (29 + 10).

When several variables are used to predict a dependent variable, a multiple-correlation coefficient R is determined. The square of the multiple-correlation

coefficient, termed the coefficient of determination, expresses the proportion of variance in the dependent variable that is explained by the independent variables acting together. Partial regression coefficients (labeled B) are still calculated in order to include the distinct contribution of each variable in the prediction of the criterion. The Analysis of Variance Table tests the significance of the regression equation: that is, whether the partial standardized regression coefficients of the individual predictors called betas (ß), are equal to zero.

Even if an overall regression equation may be significant, one has to determine which predictors are making significant and meaningful contributions toward predicting or explaining the criterion variable. These beta values, therefore, are tested for significance using the t-test.

The relative sizes of partial regression coefficients may give an indication of how meaningful they might be in the regression equation. A reasonable starting point is to examine the zero-order correlations of the predictor variables with the criterion variable. Another factor that influences not only the significance and meaningfulness of predictor variables but also the multiple correlation coefficient (R) is the extent of intercorrelations of the predictor variables.

An examination of Table 25 shows that there happens to be a reasonable degree of intercorrelations among the

scales of diligence. It is also observed that the correlation coefficients between ability and competence (.53) and between motivation and competence (.43) are much higher than the coefficients between the other four diligence scales and competence. The range is .08 to .19. It is expected that ability and motivation will be both significant and meaningful in a regression equation with all six predictors (ability and the five diligence scales), but the four other scales are expected to be neither significant nor meaningful.

TABLE 25

MATRIX OF ZERO-ORDER CORRELATION COEFFICIENTS FOR ABILITY, COMPETENCE, AND THE FIVE SCALES OF DILIGENCE

Variable	A	Cm	M	Cn	Cf	D	S
Ability	1.00						
Competence	.53	1.00					
Motivation	.14	.43	1.00				
Concentration	.12	.16	.48	1.00			
Conformity	-.13	.19	.55	.40	1.00		
Discipline	.15	.16	.42	.24	.23	1.00	
Spirituality	-.06	.08	.43	.39	.41	.24	1.00

Very notable are the relatively high correlation coefficients between all the scales and motivation, which happens to be the only scale with a fairly high correlation coefficient with competence. Norusis (1986) pointed out that when highly intercorrelated independent variables are included in a regression equation, the overall regression may be significant while none of the individual coefficients are significant. This situation applies to this study to a certain extent.

After ascertaining that the underlying assumptions for multiple linear regression were satisfied, hypotheses 5 and 6 were tested. It was expected that hypothesis 5 would prove fruitful since it involved only two predictors that were both highly significant and meaningful. Hypothesis 6 tested an equation with six moderately intercorrelated variables. Two predictors were highly significant and meaningful but the other four turned out to be neither significant nor meaningful.

Hypothesis 5: There is no significant multiple correlation between competence and a linear combination of diligence and ability.

Essentially, this hypothesis tests whether the betas for diligence and ability are zero: (Ho: $\beta_D = \beta_A = 0$). Table 26 is the ANOVA table for testing this hypothesis. The null hypothesis is not retained ($F_{2, 137} = 39.8$, $p < .001$). It can be stated that there is a significant

multiple correlation between competence and a linear combination of diligence and ability. The multiple correlation coefficient is .61 which means that diligence and ability account for 37% of the variance in competence.

Table 27 presents the regression coefficients to be used in the equation (B), the beta values, the partial correlation coefficients, the t-values for the betas, as well as probabilities for the t-values, for the two predictors. The regression equation for predicting competence from diligence and ability is:

Competence = .9662 + .0055(Diligence) + .0578(Ability)

TABLE 26

ANOVA TABLE FOR THE DILIGENCE-ABILITY REGRESSION EQUATION

Source	df	Sum of Squares	Mean Square	F ratio	P
Regression	2	12.17	6.08	39.85	.0000*
Residual	137	20.92	.15		

* Significant at the p < .001 level

TABLE 27

REGRESSION INFORMATION
ON DILIGENCE AND ABILITY

Predictor	B	Std Error of B	Beta	Partial Corr.	T-Value	p
Diligence	.0055	.0013	.29	.34	4.29	.0000*
Ability	.0578	.0076	.51	.54	7.56	.0000*

* Significant at less than the .0001 level.

Hypothesis 6: There is no significant multiple correlation between competence and a linear combination of the 5 scales of diligence and ability.

This hypothesis tests whether the betas for the five scales of diligence, and ability are equal to zero. (Ho: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_A = 0$). Table 28 presents the ANOVA table for testing this hypothesis. The null hypothesis is not retained ($F_{6,133} = 17.1$, $p < .001$). It can be stated that there is a significant multiple correlation between competence and a linear combination of the five scales of diligence and ability. The multiple correlation coefficient is .66 indicating that the six predictors account for 43% of the variance in competence.

TABLE 28

ANOVA TABLE FOR THE SIX-PREDICTOR MODEL

Source	df	Sum of Squares	Mean Square	F ratio	P
Regression	6	14.39	2.39	17.05	.0000*
Residual	133	18.70	.14		

* Significant at less than the .0001 level.

This is 6% more than using the diligence total scores in the two-predictor model. Table 29 presents the regression information for the 5 scales and ability.

The regression information for the six-predictor model is presented in Table 29. This is an interesting situation in which four of the five scales that constitute diligence are not significant nor meaningful predictors, but the overall proportion of variance explained by the six-predictor equation is 6 percent greater than the model that uses diligence total scores and ability.

The Motivation scale and ability are very significant and meaningful predictors in the six-predictor model and account for most of the variance in competence. The question is what contribution do the other four scales of diligence make in the prediction of competence.

TABLE 29

REGRESSION INFORMATION
ON THE SIX-PREDICTOR MODEL

Predictor	B	Std Error of B	Beta	Partial Corr.	T Value	Prob. of T
Ability	.0582	.0078	.52	.55	7.50	.0000*
Motivation	.0173	.0039	.40	.36	4.46	.0000*
Concentration	-.0086	.0067	-.10	-.11	-1.27	.2040
Conformity	.0072	.0052	.11	.12	1.39	.1684
Discipline	-.0075	.0067	-.08	-.09	-1.17	.2658
Spirituality	-.0042	.0068	-.05	-.05	-.63	.5326

* Significant at less than the .0001 level.

According to Norusis (1986), they may be working counterintuitively since the signs of three of the scales are negative. This situation seems to be anomalous and warrants further study.

Intuitively, the scales of diligence are expected to be good predictors of competence. The fact that four scales are not significant nor meaningful predictors may be sample specific. This situation may also be a reflection of the way diligence is rewarded by teachers in these schools. One can speculate that with a more structured approach to teaching diligence to students coupled with a systematic method for rewarding such diligence through a

more careful assignment of grades, the beta values should improve and show significance. For this reason the regression equation involving the six predictors is not developed at this stage.

Demographic Differences in Diligence

Hypotheses 7 and 8 are discussed together for convenience.

Hypothesis 7: There are no significant gender and grade main effects in diligence among high-school students.

Hypothesis 8: There is no significant gender by grade interaction in diligence among high-school students.

Table 30 presents the Two-Way ANOVA table for diligence by gender and grade. Null hypothesis 7 is not retained. There are significant gender and grade main effects in diligence among high-school students ($p < .001$). Also null hypothesis 8 is retained; there is no gender by grade interaction.

It can be stated that female students tend to be more diligent than male students irrespective of grade level (junior/senior), and that juniors tend to be more diligent than seniors, irrespective of gender. This information is displayed in Table 31. Tables 32 and 33 display statistical summaries for gender and grade level differences respectively.

TABLE 30

TWO WAY ANOVA TABLE OF DILIGENCE
BY GENDER AND GRADE

Source	df	Sum of Squares	Mean square	F ratio	P
Gender	1	7468.27	7468.27	12.72	.000*
Grade	1	8778.80	8778.80	14.95	.000*
GG Interaction	1	15.20	15.20	.03	.872
Error	205	587.09			

* Significant at the p < .001 level

TABLE 31

GENDER BY GRADE SUMMARY OF MEANS ON DILIGENCE
(NUMBERS ARE IN PARENTHESES)

	Junior	Senior	Total
Female	198.98 (54)	185.26 (61)	191.70 (115)
Male	186.21 (33)	173.61 (61)	178.03 (94)
Total	194.14 (87)	179.43 (122)	185.56 (209)

TABLE 32

STATISTICAL SUMMARY OF GENDER DIFFERENCES IN DILIGENCE

Gender	N	Mean	Stand. Deviation	Stand. Error	Minimum Score	Maximum Score
Female	116	191.41	25.04	2.32	137.00	252.00
Male	94	178.03	25.00	2.58	124.00	237.00

TABLE 33

STATISTICAL SUMMARY OF GRADE LEVEL DIFFERENCES IN DILIGENCE

Grade	N	Mean	Stand. Deviation	Stand. Error	Minimum Score	Maximum Score
Junior	89	194.64	26.42	2.80	129.00	252.00
Senior	122	179.43	23.66	2.14	124.00	233.00

Hypothesis 9: There is no significant difference in diligence between students in the three age groups defined in this study.

Table 34 presents the ANOVA table for diligence by age group. The null hypothesis is not retained. Differences between the means of the groups are significant

at a probability level less than .001. There is a significant difference in diligence mean scores between the three age groups.

A Newman-Keuls test shows that there is a statistically significant difference between the youngest students and each of the two older groups, but there is no significant difference in diligence between the two older groups. Table 35 displays these results.

TABLE 34

ONE WAY ANOVA TABLE OF DILIGENCE BY AGE GROUP

Source	df	Sum of Squares	Mean Square	F ratio	P
Age group	2	12787.31	6393.65	10.20	.0001*
Error	203	127174.29	626.47		

* Significant at the p < .001 level

Table 36 presents the number of subjects, mean, standard deviation, standard error, minimum score, and maximum score for the three age groups.

TABLE 35

NEWMAN-KEULS COMPARISON OF MEANS ON DILIGENCE BETWEEN THE THREE AGE GROUPS

Age group	Mean	#	Group number 1	2	3
Under 16 years	197.01	1	--		
16 Y - 17Y 5M	180.04	2	*	--	
17 Y 6 M and over	180.61	3	*	NS	--

* Means significantly different at the $p < .05$ level

TABLE 36

STATISTICAL SUMMARY OF THE THREE AGE GROUPS ON DILIGENCE

Age Group	N	Mean	Stand. Deviation	Stand. Error	Minimum Score	Maximum Score
Under 16 years	69	197.01	25.86	3.11	129.00	252.00
16Y - 16Y 5M	68	180.04	26.36	3.20	124.00	233.00
16Y 6M and over	69	180.61	22.72	2.73	141.00	232.00

Hypothesis 10: There is no significant difference in diligence between students in the four socioeconomic levels defined in this study.

Table 37 presents the ANOVA table for diligence by socioeconomic level. The null hypothesis is retained since a probability level of .08 exceeds the criterion level of .05. It can be stated that there is no significant difference in diligence mean scores between the four socioeconomic levels for the population of students under study.

TABLE 37

ONE WAY ANOVA TABLE OF DILIGENCE BY SOCIOECONOMIC LEVEL

Source	df	Sum of Squares	Mean Square	F ratio	P
Socioeconomic Level	3	4564.29	1521.43	2.28	.08
Error	193	128706.97	666.87		

Summary

This chapter tested the 10 hypotheses for the study. It can be stated that the DI appeared to have construct validity. A regression model for predicting competence from diligence and ability was formulated and demographic differences in diligence were reported.

CHAPTER VI

SUMMARY, CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS

Summary

The purpose of this study was to operationalize the construct diligence as it relates to education by developing a Diligence Inventory (DI) for high-school juniors and seniors. The idea behind this exercise was to develop an intervention model for explaining student competence that involved both ability and the extent of students' involvement in their education--the diligence component.

The study was a response to the Educational Reform Movement's continuing search for variables that were more under the control of the teaching-learning situation and, more specifically, under students' direct control that could explain or predict student competence. It was advanced that in the quest for achieving greater accountability for educational outcomes, students themselves should be held more responsible for their learning.

Student effort, therefore, was viewed as crucial to this aspect of accountability. The goal was to identify

variables that could be manipulated by students themselves and which correlated well with competence.

The distinction was made between intervention and non-intervention models which were defined by **dynamic** and **static** predictors, respectively--terms that are situation specific. A static predictor describes a state of affairs and can fairly accurately predict a criterion if conditions remain the same. A static predictor is suitable for following trends. For example, past GPA is usually a very good predictor of future GPA.

On the other hand, a dynamic predictor is one that is subject to relatively easy manipulation for making changes in the criterion at will. For example, in the situation where diligence is used to predict competence (future GPA), an important point is that diligence and competence are different entities--a requirement in a dynamic predictor model. In this respect, diligence is manipulated to have a calculated effect on competence.

Since this study was concerned with developing an intervention model for predicting competence, an intense search was conducted for dynamic predictors associated with student effort. Logically, the operational definition of diligence, of necessity, centered around student effort toward educational development.

The review of literature had two main objectives. One objective was to identify dynamic predictors that would help in the operational definition of diligence. This

aspect of the review covered: study strategies, motivation and attribution theory, homework, time and learning, television viewing, and the profile of the high school dropout. A few studies on diligence were cited; however, the construct was not operationally defined in any of them.

The other aspect of the literature review dealt with establishing context and rationale for the study as well as providing a philosophical foundation for conceptualizing diligence. As such, the educational reform agendas for the past three decades were reviewed, with special emphasis on the accountability movement, including student responsibility for learning, minimum competency and standardized testing, and the effort-ability debate in explaining student competence. The philosophical foundations upon which diligence was based consisted of the tenets of holistic education, namely, the balanced development of an individual in the physical, mental, social, and spiritual dimensions.

The development of the inventory started with a working definition of diligence which was envisioned to be comprised of three broad domains of Industry, Citizenship and Character, and Cognitive Skills. These domains were defined and regarded as initially consisting of 12 scales. The scales were defined and 126 items were written to represent the scales. The inventory was then judged for content by 12 experienced educators.

Upon refining the 120-item DI, it was subjected to

two pilot studies using sample sizes of 74 and 33 students, respectively. The alpha reliability coefficient of the instrument and the point-multiserial coefficient of the items were estimated. Reliability coefficients ranging from .46 to .90 and above, and point-multiserial correlation coefficients of .25 and above were considered to be acceptable.

This procedure was used to eliminate inappropriate items or scales. The first pilot study resulted in the elimination of 65 items and the rewording of 19 of the remaining 55 items, as well as the reorganization and/or renaming of three of the resulting six scales. The alpha reliability coefficient of the 55-item instrument at this stage was .9199, and the point-multiserial correlation coefficients of 47 items with values above the criterion level of .25 ranged from .3116 to .6448.

The following six scales emerged at this stage of the development of the DI.

. Time Management and Study Skills
. Motivation
. Thoroughness and Persistence
. Discipline and Devotion
. Conformity and Responsibility
. Concentration and Assimilation

The second pilot test served to further refine the instrument by rewording ten more items. The alpha reliability correlation coefficient of the instrument was

.8886 and point-multiserial correlation coefficients were similar to those of the first pilot test. This version of the instrument was then used for the study.

The population for the actual study consisted of all juniors and seniors who attended the five participating schools in five southwestern Michigan counties. The effective sample consisted of 237 students made up, for the most part, of intact classes.

In addition to their responses to the DI, students' performance measures on ability and competence were obtained from the school records. Teachers supplied subjective estimates of students' diligence which were used for determining the construct validity of the DI by the method of Known-Group Difference. Ability was measured by the ACT, PSAT, or SAT and competence was measured by semester GPA. The PSAT and SAT scores were converted to equivalent ACT scores for use in the statistical analysis.

Item analysis was performed on the entire instrument and on the six scales. This instrument yielded a reliability of .9021 and the point-multiserial correlation coefficients of 45 of the 55 items ranged from .2537 to .6806. Five of the ten items with point multiserial coefficients below .25 had values less than .20, and the effects of eliminating those five successively were followed. It was decided to retain all the items for content validity purposes since including these five worst

items did not have any adverse effect on the overall reliability of the instrument.

The DI was then factor analyzed in order to confirm the preconceived dimensions of diligence. As it turned out, the five-factor structure was the most appropriate in terms of stability and content of the scales. Two scales were lost through redistribution among the other scales. The contents of the five scales were altered but not to the extent that it was necessary to find entirely new names. The reliability coefficients of the five scales were all higher than those of the six-scale instrument and the point-multiserial correlation coefficients of the items generally improved.

Since the number of scales (5) was so close to the number of domains proposed (3), and because the number of scales in each domain was drastically reduced, it was deemed more practical to de-emphasize the domains and consider the DI a five-dimensional instrument.

The five scales that comprised the final DI were:

. Motivation
. Concentration and Assimilation
. Conformity and Responsibility
. Discipline
. Devotedness and Spirituality.

Ten hypotheses were tested. Hypothesis 1 related to the establishment of construct validity of the DI. Hypotheses 2 through 6 tested for relationships among

diligence, ability, and competence, and hypotheses 7 through 10 tested for demographic differences in diligence among students.

Conclusions

The definition of diligence that emerged from this study is based on a five-dimensional instrument. This definition is basically the same as the original working definition except that the domains are omitted and there are five scales instead of 12. Slight modifications in the definitions of three scales were made.

Operational Definition of Diligence

Diligence in a student is defined as an expression or reflection of the effort expended toward balanced or holistic development in the mental, physical, social, and spiritual dimensions, as indicated through measurement by the five scales as defined:

Motivation--Drive to get started and continue along a certain course of action with an intended result in mind.

Concentration and Assimilation--the act of focusing attention on a problem, task, or impending situation through a process by which all new experience, when received into the consciousness, is modified so as to be incorporated with the results of previous processes, and the interaction in which a subject or its parts are mentally conceived.

Conformity and Responsibility--the act of maintaining harmony or the status quo in an organized setting by demonstrating maturity with respect to dealing with one's self and significant others.

Discipline--the training of the will.

Devotedness and Spirituality--practices that contribute to building good morals and self-esteem.

The 55 items that comprise the DI are presented by scales in Chapter 4. The actual instrument is found in Appendix G .

Findings

These findings relate to the testing of the 10 hypotheses. Apart from null hypotheses 2 and 10 which were retained, the following hypotheses were significant at less than the .001 level.

1. There was a significant difference in diligence (as measured by the DI) between the three groups of students that teachers subjectively classified as having low, average, and high diligence. Each of the three groups of students was statistically different from the other. The construct validity of the DI, therefore, was established by the method of Known-Group Difference.
2. There was no significant zero-order correlation between students' diligence and ability scores.

3. There was a significant zero-order correlation (.54) between students' ability and competence scores.
4. There was a significant zero-order correlation (.32) between students' diligence and competence scores.
5. There was a significant multiple correlation between competence and a linear combination of diligence and ability. The multiple-correlation coefficient was .61 which meant that diligence and ability in combination accounted for 37% of the variance in competence.
   The regression equation for predicting competence from diligence and ability was:
   Competence = .9662 + .0055(Diligence) + .0578(Ability)
6. There was a significant multiple correlation between competence and a linear combination of the 5 scales of diligence and ability. The multiple-correlation coefficient was .66 indicating that the six predictors accounted for 43 percent of the variance in competence.
7. There was significant gender and grade main effects in diligence among high-school students.
8. There was no significant gender by grade interaction in diligence among high-school students.
   Combined with hypothesis 7, this means that female students were more diligent than male students across the two grades, and juniors were more diligent than seniors across the genders.
9. There was a significant difference in diligence between students in the three age groups defined in this study.

There was a statistically significant difference between the youngest students and each of the two older groups, but there was no significant difference in diligence between the two older groups.

10. There was no significant difference in diligence between high-school students in the four socioeconomic levels defined in this study.

Discussion

This dissertation involved the development and application of a diligence-ability regression model for explaining and predicting competence among high-school students. As such, matters pertaining to both the development and application aspects of the model are discussed.

Development of the Regression Model

This aspect of the study focused primarily on the development of the DI which to some extent was by trial and error. This was not unusual for an instrument development exercise. First, a working definition of diligence was formulated that made possible the creation of scales and then the writing of items for the scales.

The approach taken was to start with a much larger number of scales and items and then refine the instrument as much as possible by item analysis until an instrument of acceptable reliability resulted. The initial 120-item, 12-

scale instrument was reduced to a 55-item, six-scale DI by item analysis. Factor analysis was then used to further refine the DI to a five-scale instrument with the same 55 items.

One of the objectives of the instrument development process was to determine the dimensions of diligence. Conceptually, diligence was conceived to be associated with the three broad domains of Industry, Citizenship and Character, and Cognitive Skills. Philosophically the definition of diligence was based on the holistic paradigm, that is, the development of the student in the mental, physical, social, and spiritual dimensions. However, the temptation to declare that diligence was either three- or four-dimensional was resisted because the nature and extent of overlap between the three domains and the four dimensions was a matter of concern in the early stages of the development of the DI.

Six dimensions of diligence were resolved by the item-analysis procedure, but factor analysis confirmed five dimensions. The three domains served as the basis for the formulation of the scales and items for the working definition of diligence. The items were reflective of student practices with respect to balanced development.

The domains were abandoned to avoid complicity in nomenclature since the numbers of domains and scales were so close (3 and 5, respectively). However, elements of the domains could still be seen in the final DI. The

Motivation scale relates to Industry; the Conformity and Responsibility scale, the Discipline scale, and the Devotedness and Spirituality scale relate to Citizenship and Character, and the Concentration and Assimilation scale is associated with Cognitive Skills.

The four dimensions of holistic development were also incorporated in the DI. Some overlap was evident between the four dimensions and the five scales. The Motivation scale, and Concentration and Attentiveness scale relate to the mental dimension; the Discipline scale relates both to the physical and social dimensions; the Devotedness and Spirituality scale is associated with the spiritual dimension and to some extent, the social dimension; the Conformity and Responsibility scale is associated with the social dimension.

Once the DI was developed, the next step was to determine the relationship between diligence, ability, and competence. The regression equation for predicting competence (future GPA) from diligence and ability (ACT) was significant and meaningful. The multiple correlation coefficient was .61, which means that diligence in combination with ability can explain or predict about 37% of the variance in competence. The regression equation is:

Competence = .9962 + .0055(Diligence) + .0578(Ability)

For example, if Joe has a diligence score of 80 and an ability (ACT) score of 15, then a projected GPA for Joe will be .9962 + .0055(80) + .0578(15) = 2.30. If Joe

raises his diligence score to 140 say, his projected GPA then will be 2.63, and if he makes extraordinary effort to improve and raises his diligence score to about 180, then his GPA should be in the vicinity of 2.85. This represents a significant improvement from a C average to almost a B average.

The regression equation for predicting competence from ability and the five scales of diligence was also significant. The multiple correlation coefficient was .66, which means that the six predictors could explain about 43% of the variance in competence. This equation was not developed for practical purposes because only two of the six predictors had partial regression coefficients that were significant. Furthermore, it was observed that the other four variables did not correlate well with competence alone.

It was suspected that although diligence was carefully defined, competence (GPA) failed to reflect attributes of diligence other than motivation. An examination of Table 29 shows the Discipline scale, the Concentration and Assimilation scale, and Devotedness and Spirituality scale have negative beta coefficients which were not significant; the Conformity and Responsibility scale has a positive beta coefficient which is also not significant.

This state of affairs suggests that either diligence was ill defined or that competence was not well

measured. This researcher tends to identify with the latter viewpoint. There is nothing wrong with GPA as a measure of competence but, in theory, it should also reflect upon a student's diligence.

What this amounts to is the recognition of the importance of diligence to competence and the need to make a deliberate attempt to reward diligence in assigning grades to students. In other words, the practice of awarding grades based on ability and sheer mastery of subject matter should be discouraged.

Hypothetically, if two students have identical average abilities in chemistry say, and student A exhibits an extraordinarily high level of diligence, and student B demonstrate a below-average level of diligence, then if diligence is properly rewarded student A should earn a better grade than student B.

This study will not attempt to work out the logistics for the operation of such a system apart from stipulating that there should be governing policies that should apply to all students in a system alike.

Application of the Regression Model

Recent reform initiatives have been stressing the need for students to be held more responsible for their educational outcome. This can only be accomplished if the extent of student involvement is monitored. Traditionally scores on standardized tests of ability or achievement like

the ACT or SAT have been used to indicate the level of competence or achievement attained by individuals or states as a measure of accountability.

It is understandable why standardized tests of ability and not GPA are used for making comparisons between students, schools, school districts, or states. It will be virtually impossible to standardize GPA for making such comparisons. But standardized ability measures correlate highly with GPA. Ability is a measure of the potential to succeed which, according to the findings of this study, does not correlate with the quality and extent of effort expenditure toward their school work--diligence. However, like ability, diligence correlates relatively highly with GPA.

The argument, therefore, is that if students are to be held more accountable for their performance, then their diligence scores should be reported along with their ability scores. Such information will more accurately explain a student's level of performance. Not only will students be held partly responsible for their performance but their diligence scores could suggest the type of intervention measures that might be appropriate for improved performance.

If a threshold level of diligence is established for a particular population, then more meaningful comparisons and interpretation of the diligence and ability scores may be made for individual students, schools,

districts, or states as the case may be. For example, if the mean diligence score for a school district is 150 and the mean ACT score is 20, and school A has means of 120 and 21, respectively, and school B has means of 165 and 19, respectively, then the administrators might want to pay closer attention to school A even though the ACT mean is slightly higher than that of school B and above the mean for the district. Students in school A might not be applying themselves at all for some reason.

It may not be possible to alter the ACT scores of the students in school A, at least in the short run, but it might be possible that their diligence scores could improve within a quarter or semester with some coaching. It does not seem fair to make comparisons on performance between students, schools, districts, or states on the basis of ability alone. This question of equity or fairness deserves some discussion with respect to the diligence-ability debate because of the tendency to stereotype students.

Typically, students of high ability are usually considered to be more diligent, and teachers are more inclined to give them better grades because diligence and ability are treated as though they are correlated. On the other hand, students of low or average ability are regarded as lazy or lacking in diligence and even though such students expend effort commensurate with earning top grades, there is a tendency to regard them as "plodders"

who just cannot get the same grades as the brighter students. This situation can be demoralizing.

This study indicates that diligence is evenly distributed among students of all levels of ability. There are brilliant students who just "goof off" and there are average students who work very diligently. But even among peers it is expected that grades are distributed according to ability alone. Sometimes when an average-ability, high-diligence student outperforms a high-ability, low-diligence student both teacher and students think that the situation is anomalous.

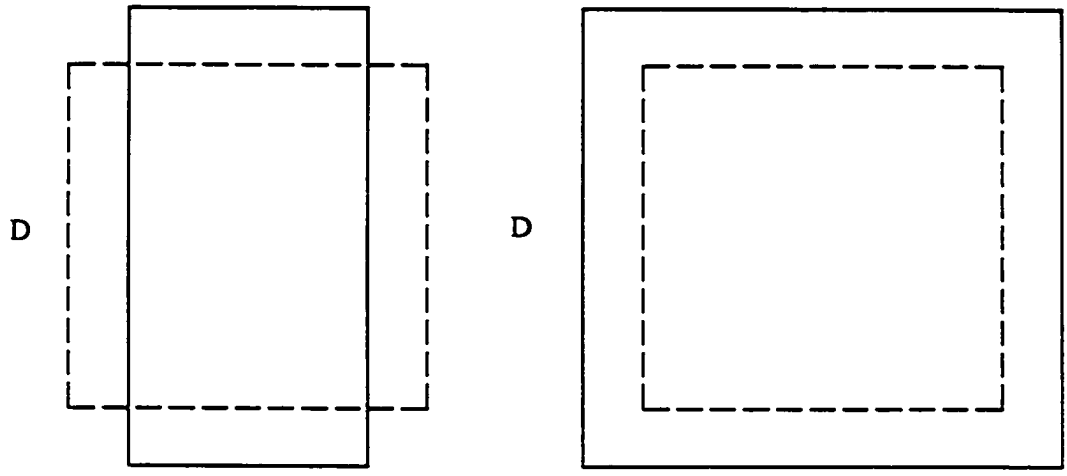
The tragedy about this state of affairs is that many a student is not as diligent as he or she should be because of the perception that diligence is not rewarded. These are usually the students of lower ability who need to compensate by working more diligently. This results in a vicious cycle of defeat in which certain students could never be convinced that they could improve their performances.

It is not fair that diligence is not rewarded when it accounts for a sizeable proportion of variance in competence. Also, if students are expected to make improvements in competence, most likely, it is the diligence component in the diligence-ability regression model that must be manipulated. It might be instructive if students' profiles on diligence and ability be provided in graphic form to facilitate interpretation and remediation.

Four types of students are envisioned if profiles are made of students on diligence and ability. These diligence-ability (DA) configurations, as they are termed, are presented in Figure 4. The vertical lines in Figure 4 represent diligence and the horizontal lines represent ability. The lengths of the lines are proportional to the diligence and ability standard scores. The research findings indicate that there is zero correlation between diligence and ability which means that they are orthogonal or at right angles to each other, making possible their representation by a rectangle. The square with the broken lines represents the mean diligence and ability scores of all the students in a particular reference group. The profiles of the four types of students are superimposed on the norm for the group so that comparisons can be made.

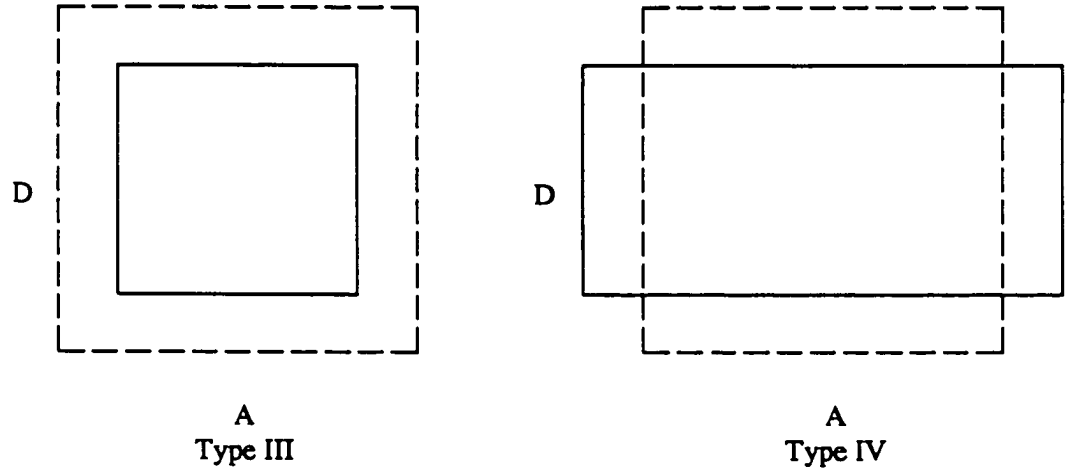
Type I students score above the mean in diligence and below the mean in ability. Type II students score above the mean in both diligence and ability. Type III students score below the mean in both diligence and ability. Type IV students score below the mean in diligence but above the mean in ability.

Another way to profile these four students would be to place them in quadrants of a Cartesian coordinate system formed by the diligence and ability axes as depicted in Figure 5. Measurements are in standard score units with the mean at the origin.



Student scores above mean on diligence, below mean on ability.

Student scores above mean on both diligence and ability.



Student scores below mean on both diligence and ability.

Student scores below mean on diligence, above mean on ability.

Figure 4: Diligence–ability configurations: profiles of four typical students. Rectangles with broken lines represent the group means on diligence (D) and ability (A), for reference.

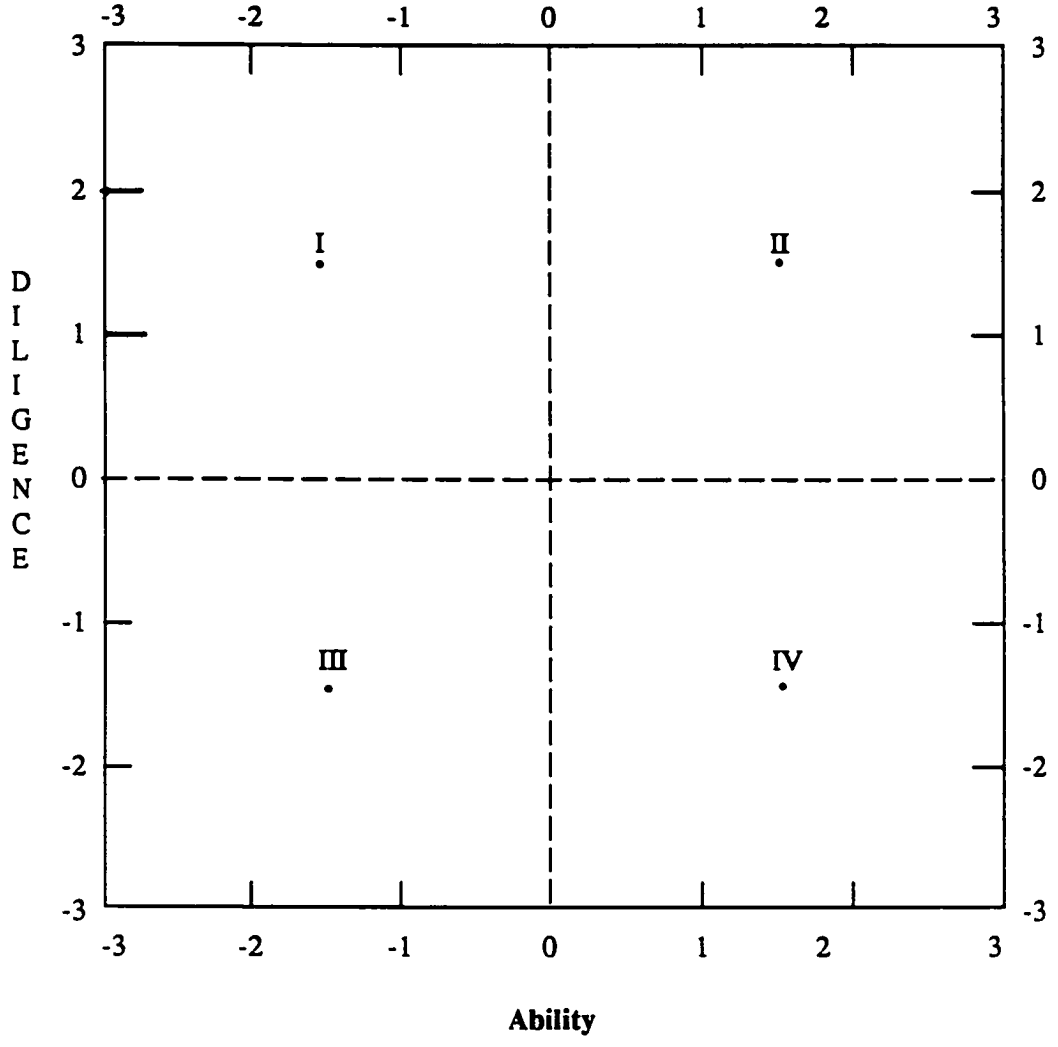


Figure 5: Diligence–ability scattergram:- graphical representation of the four typical students on diligence and ability.

With this system administrators could profile students in a single school, profile schools in a district, or profile states on diligence and ability. Such profiles and scattergrams of students and the schools may be generated on the computer by special programs written for these purposes. It is hoped that such profiles and scattergrams could help to satisfy the demands for better accountability of student performance.

Recommendations

Further Research and Development

The following suggestions for further research and development on this subject are in order:

1. The study should be replicated using larger and more representative samples for the pilot studies and the actual study, particularly to see how the composition of the scales and items compare with those of this study.
2. The DI developed in this study should be validated for a much larger population, possibly an entire state.
3. There is a need to explore different options for rewarding, through their GPA, the non-intellective aspects of students' educational development that are related to the five scales of the DI.
4. Hypothesis 6 (which investigates whether there is a significant multiple correlation between competence and a linear combination of the five scales of diligence

and ability) should be tested using a revised system for computing competence (GPA) as suggested in recommendation #3.

5. The DI should be tested on all four grades in the high school to determine if the instrument is suitable for freshmen and sophomores as well, and the modifications that might be necessary so that the same instrument can be used for all high-school students. It will then be possible to make comparisons of diligence among students in all the grades in the high school.
6. Different versions of the DI can be developed for the elementary, junior high, and college levels.
7. Diligence may be defined as it relates to the world of work and a suitable instrument can be developed.
8. Differences in diligence due to the following groups need to be investigated using samples that are more generalizable.
   - Ethnic background of student
   - Type of school attended (private versus public)
   - Size of school attended
   - Location of school attended (urban, suburban, etc.)
   - Socioeconomic level of student
9. An experiment should be done to determine if students' diligence scores can improve with teaching.
10. Experiments should be conducted at different grade levels to compare the correlation coefficient between diligence pretest scores and ability, and diligence

posttest scores and ability, in situations where diligence is taught to students. The objective is to determine whether "learned" diligence correlates significantly with ability.

11. Similar experiments as in #10 where diligence is taught to students should be conducted to compare the correlation between diligence pretest scores and competence, and diligence posttest scores and competence.
12. A computer generated system of profiling students, schools, school districts, and states should be developed on the basis of diligence and ability that would provide diligence-ability configurations of individual students, and scattergrams of students, schools, districts, or states, as the case may be, for purposes of accountability and intervention.
13. Discriminant analysis may be used to determine which scales of diligence discriminate the different demographic groups (grade, gender, age, ethnic etc.).
14. Step-wise multiple regression may be used to determine the best prediction model for competence from among the scales of diligence and students' ability.

Applications

1. The diligence-ability regression model may be used to predict competence among high-school students in the appropriate population.

2. The scores on the individual scales of the DI may be used as the basis for recommending intervention measures for students who are below average in diligence.
3. A curriculum should be developed to teach diligence to students. It is further recommended that such a curriculum should be integrated into the subject matter curricula and used systematically.
4. Students' diligence scores may be used as estimates of the extent of their involvement in the educational enterprise and, therefore, may satisfy the demand for making students more responsible for their educational results.
5. Educational administrators and policy maker should require that both diligence and ability be reported in statistics for accountability purposes.
6. The question of equity may be addressed to some extent by diligence-ability configurations and scattergrams.
7. Schools should develop a system to reward diligence that is reflected in GPA and students should be aware of the mechanics of the system.
8. Administrators should sensitize teachers to the pitfalls of stereotyping students positively based on ability and negatively based on diligence, and the practice should be discouraged.
9. The study suggests that older high-school students are not as diligent as younger students. If teachers and

administrators are aware of this trend, appropriate intervention measures may be taken in time to avert the negative effects on student performance. Formally attempting to build on the diligence possessed by students in their younger years might reap dividends in the later years of high school.

10. The study also suggests that female students are more diligent than males. In general, this is not unusual for junior/senior levels as the males tend to have more distractions than females. It is suggested that males be targeted early with intervention measures that could arrest the tendency toward becoming more indifferent toward school work than their female counterparts.
11. Addressing the matter of diligence particularly, in the last two years of high school, could have serious implications for influencing students to attend and stay in college.
12. This study suggests that there might be a case for fostering holistic education in public as well as private schools.

APPENDICES

APPENDIX A

CORRESPONDENCE

- Letter 1
- Letter 2
- Letter 3
- Letter 4
- Letter 5
- Letter 6
- Letter 7

ANDREWS
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[Letter 1]

Dear Principal:

I am writing to request the involvement of three to four members of your staff, one junior class and one senior class, in the pilot testing of a diligence inventory (DI). This dissertation project is part of the requirements for the completion of a Ph.D. degree in Educational Administration and Supervision at Andrews University.

This study will attempt to develop and validate a diligence inventory, and will try to determine if diligence can by itself,or in combination with ability, be better able to explain and predict competence among juniors and seniors. Ability can be measured using the PSAT/SAT or ACT. Competence (performance) can be measured by GPA, computed on four subject areas taken in the junior and senior years: English, mathematics, science and social studies. In this research the construct diligence will be defined and rendered measurable through the DI.

This study might have the potential for explaining student competence on the basis of two factors: one over which students have very much control (diligence),and another over which they have very little control (ability). Traditionally ability measures have been relied heavily upon for predicting and explaining a student's performance. The model under investigation will factor in student involvement with his/her education--the 'effort' component. There will be scope for explaining to students on a quantifiable basis, how his/her grades can be self regulated by self manipulation of the diligence component.

Your assistance is requested in the following areas:
1. We require three to four members of your staff to judge the enclosed DI for content validity. The instructions for doing so are included with the DI. We will want these members of staff to have at least five years experience working with high school juniors and/or seniors. We need the opinions of one administrator (principal or assistant principal), one counselor and one or two teachers. There is no risk associated with judging the DI and acknowledgement will be accorded staff members in the appropriate section of the dissertation.

Berrien Springs, Michigan 49104/(616) 471-7771

2. Upon refinement of the DI, we will need 30 students (15 juniors and 15 seniors) to participate in the pilot testing during the first week of school in January 1990. These students should have taken the PSAT/SAT or ACT, and courses in the four subject areas (English,mathematics,science and social studies) during the first marking period. The DI should pose no risk to students and every effort will be made to preserve confidentiality. Parental consent will be sought through the enclosed consent forms. It will be appreciated if these forms be distributed to all juniors and seniors to be returned before the Christmas break.

3. Upon completion of the DI we will need a student's total raw score on the PSAT/SAT or ACT, along with percentage scores in the four subject areas specified. Also please have a teacher or advisor indicate whether a student belongs to the upper or lower half of the class on diligence, by writing a U or L to the top of each returned DI. This information is necessary for establishing the construct validity of the inventory.

It will be greatly appreciated if staff members could judge the DI before the Christmas break. In this way the instrument can be readied for pilot testing early January 1990. It will also help a lot if the students can complete the DI during the first week of school in January.

We will be very grateful if you, your staff and students could spare the time and attention to making this project a reality.

Sincerely,

Hinsdale Bernard
Doctoral Candidate

Dr. E. A. Streeter, Chairman
Educational Administration
Andrews University

ANDREWS
UNIVERSITY

[Letter 2]

Dear Educator:

I need about one hour of your time. I am requesting your participation in the content validation of a diligence inventory (DI) for high school juniors and seniors. This dissertation project is part of the requirements for the completion of a Ph.D. degree in Educational Administration and Supervision at Andrews University.

This study will attempt to achieve two primary objectives:
1. The construct diligence will be operationalized with respect to high school juniors and seniors, by developing and validating a diligence inventory.
2. The DI will be administered to high school juniors and seniors to determine if it will by itself, or in combination with ability as measured by PSAT/SAT or ACT, be better able to explain or predict student competence (performance) as measured by the most recent GPA computed on four subject areas: English, mathematics, science and social studies.

The students will be required to respond to the DI, which is based on a Likert-type scale consisting of a list of items with 5 possible choices: (1) Rarely (2) Occasionally (3) Sometimes (4) Usually (5) Almost always. The content of the DI itself should pose no threat to the students and should require on the average about 30 minutes to complete. (See "Directions for Completing the Diligence Inventory").

This study might have the potential for explaining student competence (performance) by two factors: one over which students have very much control (diligence) and another over which they have very little control (ability). Traditionally ability measures have been relied heavily upon for predicting and explaining student performance. The model under investigation will factor in student involvement with his/her education - the 'effort' component. There might be scope for explaining to students on a quantifiable basis, how his/her grades can be self regulated by self manipulation of the diligence component.

Before the DI can be relied upon it must be validated both for content and construct validity. You are being asked to participate in the content validation by judging the definition of the construct 'diligence ', as well as the domains and scales that are subsumed. Please follow the instructions for judging the DI and respond accordingly.

I will want to acknowledge this important part you will perform in the appropriate section of the dissertation. If you feel comfortable about it, you are welcome to write your name on the DI. Otherwise you may remain anonymous and the names of the judges can be obtained from the principal for purposes of acknowledgement.

Thank you sincerely for your contribution to this educational exercise. Please return this package in the envelope to the principal. If you have any further questions, feel free to call me at 471-7274.

Sincerely

Hinsdale Bernard
Doctoral Candidate

Dr. E. A. Streeter, Chairman
Educational Administration
Andrews University

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[Letter 3]

Dear Educator:

With respect to our discussion concerning the pilot testing of a diligence inventory for my study, enclosed please find the following items:

(1) 65 Diligence Inventories
(2) 65 answer sheets
(3) 70 Consent Forms
(4) 3 Administration of the Diligence Inventory:
Directions for the Proctor
(5) 3 Students' Performance Measures Sheets
(6) 3 Evaluation of the DI Pilot Testing
(7) A return address label and stamps

After parental approval has been obtained, I will appreciate if the inventories can be administered to one junior and one senior class as we discussed, and returned with the answer sheets and the performance measures sheets, possibly in the same package. It will be very helpful if the proctors can respond to the short evaluation of the pilot testing. This feedback will assist me in making meaningful adjustments.

I will be greatly indebted to you, the staff and students who may be involved, for your cooperation and support. A copy of this letter will be forwarded to the principal for his information. If you have any questions please feel free to call me at 471-7274 after 1:00 pm Monday through Friday.

Sincerely,

Hinsdale Bernard
Doctoral Candidate

Dr. E. A. Streeter, Chairman
Educational Administration and Supervision
Andrews University

[Letter 4]

ANDREWS UNIVERSITY

Dear Parent/Guardian:

I am requesting your approval for your child to respond to a diligence inventory (DI) which is being standardized for high school juniors and seniors. This is part of my doctoral dissertation project, which is investigating the relationship between diligence (hard work) and ability on academic performance.

The DI has 55 statements to which students will respond by choosing a number (from 0 to 4) representing never to always. It will take about 15 minutes. I am also requesting approval for the school to release his/her ACT or PSAT/SAT **Total** and GPA scores.

Students will be asked **not to write their names** anywhere. A coding system will be used for recording students' ability and performance scores. I will be grateful if you would return the completed consent form to your child's school tomorrow.

Thanks a million for your help.

Sincerely yours,
Hinsdale Bernard
Doctoral Candidate

Dr. E. A. Streeter, Chairman
Educational Administration and Supervision
Andrews University, Berrien Springs MI

DILIGENCE STUDY CONSENT FORM

I hereby **give** --- **do not give** --- consent for my child ---------- to take the Diligence Inventory and for the school to release the standardized test and GPA scores. I understand that my child's identity will not be revealed to the researcher.

Signature ---------- Date ----------

ANDREWS UNIVERSITY
Berrien Springs Campus
1874

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[Letter 5]

Dear Principal:

My dissertation project in Educational Administration and Supervision at Andrews University, involves the validation of a Diligence Inventory (DI), and establishing the relationship, if any, between diligence, ability and performance of high school juniors and seniors.

Based on my recent contact with your office, I have enclosed the following items for your examination: the DI, a Student Performance Measures Sheet (SPMS), and a letter seeking parental consent, where necessary. I need 24 juniors and 24 seniors from your school to participate in the study. The SPMS is designed to record a student's standardized test score (ability), GPA (performance), and an estimate of diligence by a teacher, using a coding system for confidentiality. **Names of students will not be required.**

If you agree for your school to assist me with this project, could you please appoint a contact person to whom I can send the material and with whom I can furthur communicate? I will be calling during the week beginning April 30, to find out your decision.

Thank you for your cooperation and support. I will be happy to provide the DI scores of your students (by ID numbers). If you have any questions please feel free to contact me at (616) 471-3478 on mornings, or (616) 471-7274 on afternoons.

Sincerely yours

Hinsdale Bernard

Hinsdale Bernard
Doctoral Candidate

E. A. Streeter

Dr. E. A. Streeter, Chairman
Educational Administration and Supervision
Andrews University

Berrien Springs, Michigan 49104 (616) 471-7771

ANDREWS
UNIVERSITY

[Letter 6]

Dear Principal:

I deeply appreciate your assistance with my dissertation project on diligence. Enclosed please find the following items for carrying out the exercise:

- 65 Diligence Inventories for one junior and one senior class
- 4 Student Performance Measures Sheets (SPMS)
- 2 Directions for the Proctor
- a return addressed envelope

Though some of the items of the DI were reworded for more clarity, the content of the instrument remains essentially the same. Please note the highlighted items that were affected.

I will appreciate if the completed DIs and SPMS **(without names)** be returned by May 23, if possible. I will provide students' scores and ranks on the DI, by ID numbers as soon as they are scored.

Thanks for your continued support. If there are further questions, I may be reached at 471-7274.

Sincerely yours

Hinsdale Bernard
Doctoral Candidate

Dr. E. A. Streeter, Chairman
Educational Administration and Supervision
Andrews University

ANDREWS
UNIVERSITY

[Letter 7]

Dear Principal:

I deeply appreciate your willingness to assist with my dissertation project on diligence. The last time we spoke in June you had indicated there might be a possibility that the clerical work of recording students' performance measures on the SPMS could be done. I did not follow up because it was vacation time.

These results will still be very valuable to my study. I am willing to assist with recording the relevant data with your approval, if your staff is too occupied at this time. If this is unlikely, the completed inventories without the student performance measures will be useful for the **validation** aspect of the study. I will be happy if they can be returned at the earliest convenience. I will provide students' scores and ranks on the DI as soon as they are scored.

Thanks for your continued support. If there are further questions, I may be reached at 471-7274.

Sincerely yours

Hinsdale Bernard

Hinsdale Bernard
Doctoral Candidate

Dr. E. A. Streeter, Chairman
Educational Administration and Supervision
Andrews University

APPENDIX B

PROTOTYPE DILIGENCE INVENTORY

- Items of the Prototype Diligence Inventory
- Point-multiserial Correlation Coefficients of the 54-Item and 24-Item Prototype Versions of the DI

ITEMS OF THE PROTOTYPE DILIGENCE INVENTORY

The items in the original inventory were stated in the past tense. However in keeping with the trend for this study they are presented in the present tense. Negative items are indicated. The highlighted items were not included in the DI that was judged for content validity. The factor that each of the 24 items loaded onto is shown in parentheses: (C) Conformity, (DR) Self-discipline and responsibility, and (AO) Application-Organization.

Students were asked to choose from the following responses:

Never Rarely Sometimes Always

1. I study on a voluntary basis. (DR)
2. - I play on evenings after school.
3. I do assignments promptly. (AO)
4. - I watch TV on evenings. (DR)
5. I have a regular exercise program.
6. I study when my parents are not at home. (DR)
7. I do work for extra credit.
8. I do my chores. (AO)
9. I ask my parent(s) for help on assignments.
10. I listen carefully in class. (C)
11. - I socialize with friends on evenings. (DR)
12. I generally ask advice of my parent(s).
13. I get help from my parent(s) on assignments.
14. I work with a study schedule. (AO)
15. - I have to be awakened on mornings for school.
16. - I watch late TV movies during the week.
17. I do extra reading voluntarily.
18. **I keep good personal records.**
19. I obey teachers promptly. (C)
20. - I have to be punished by parent(s). (DR)
21. **I keep my room tidy.**
22. I obey my parent(s) promptly. (C)
23. **I read widely.**
24. - I have to be punished by my teacher(s).
25. I am concerned about my grades.
26. - **I like to take advantage of weaker students. (DR)**
27. I take good class notes.
28. **I set goals for myself. (C)**
29. I purpose to excell in whatever I do. (C)
30. **I study the Bible daily. (AO)**
31. **I work for my own pocket money. (AO)**
32. I like challenging situations. (AO)
33. **I like to go on errands.**
34. I do extracurricular activities.
35. - **Phone calls disrupt my studies.**
36. **I have a savings account at home or in a bank.**
37. I like to pray. (C)

38. I purpose to complete whatever I start.
39. I am trusted by others. (C), (AO)
40. I am enthusiastic to do my assignments.
41. I like creative activities.
42. I am dependable at home.
43. I cooperate with my class teacher(s). (C)
44.- I cheat on assignments. (C)
45.- I like to leave my assignments for the last minute.
46.- I attend class late.
47.- I cheat on tests and quizzes.
48.- I disrupt class by talking out of turn. (C)
49.- I depend on my natural ability for tests.
50.- I get annoyed with myself if I fail test(s).
51. I make good use of my leisure time.
52.- My parent(s) have to urge me to study. (DR)
53. I take advice from my parent(s). (AO)
54. I like routine activities.

TABLE 38

POINT-MULTISERIAL CORRELATION COEFFICIENTS OF THE 54-ITEM AND 24-ITEM PROTOTYPE VERSIONS OF THE INVENTORY

Item	Point-multiserial Coefficients 54-item	24-item
1	.4229	.4163
2	.2186	
3	.2723	.3016
4	.2183	.2813
5	.3400	
6	.3571	.1244
7	.1068	
8	.4090	.4388
9	.2469	
10	.6231	.7018
11	.3377	.4136
12	.3405	
13	.2267	.1697
14	.1787	
15	.1981	
16	.2932	
17	.4415	
18	**.3152**	
19	.5439	.5655
20	.4113	.4530
21	**.3482**	
22	.5038	.5112
23	**.3837**	
24	.5036	
25	.3531	
26	**.4339**	**.4696**
27	.4813	
28	**.4806**	**.5708**
29	.5104	.5579
30	**.1424**	**.2546**
31	**.0756**	**.1332**
32	.3132	.2917
33	**.1504**	
34	.1936	
35	**-.0518**	
36	**.1969**	
37	.4468	.4852
38	.3984	
39	.5621	.5453
40	.3769	

TABLE 38--Continued

Item	Point-multiserial Coefficients 54-item	24-item
41	**.1132**	
42	.3035	
43	.5348	.5357
44	.5857	.6023
45	.2532	
46	.4572	
47	.4175	
48	.4123	.4054
49	.1203	
50	.1117	
51	.3246	.4601
52	.4288	
53	.3978	.4198
54	**.2024**	

APPENDIX C

THE CLASS PROJECT DILIGENCE INVENTORY

- Joint Class Project Version of the DI
- Point-multiserial Correlation Coefficients of the 80-Item and 57-Item Versions of the DI
- Contributors of the Class Project DI

JOINT CLASS PROJECT VERSION OF THE DI

Read each statement carefully. At the left of each line write the number which is most descriptive of you, using the following: (Negative items are indicated)

1 = Never
2 = Seldom
3 = Frequently
4 = Usually
5 = Always

1. I strive to do the best I can in school.
2.- **I arrive late for my classes.**
3.- I am happy to receive a C grade when I could have done A work on my assignments.
4. I take a lot of care when I do my assignments.
5. I make sure that my assignments are done correctly.
6.- I would rather draw pictures in class than take notes.
7.- I would rather look out the window than pay attention to the teacher.
8. I do homework before I spend time with friends.
9.- **Some assignments are just too long to finish.**
10.- I play first and do homework second.
11. I do not hand in an assignment until I am sure it is correct.
12. I take care to complete all my assignments.
13.- I hurry through my work so that I could do other things.
14.- If assignmrnts are a little late it is ok.
15. I listen to everything the teacher says in class.
16. I try to do well in all my subjects.
17.- Some subjects are so difficult they are not worth the effort.
18. My parents help me do my homework.
19.- **I feel that I am working on my schoolwork as much as I should.**
20.- **I spend too much time doing homework when I should be helping around the house.**
21. When I do something I do it to the best of my ability.
22. I am persistent.
23.- **I daydream during class.**
24. I am well prepared for tests.
25.- I am easily distracted from whatever I am doing.
26.- My friends see me as very organized.
27. I proofread all assignments before turning them in.
28.- It is hard for me to concentrate in class.
29.- **I would rather stay inside and study than play.**
30. **I am able to work ahead in class.**
31. I like to study.
32.- My desk is messy at school.
33. **I am younger than most students in my class.**
34.- My teacher assigns too much homework.

35. **I am able to set a time to begin my work and start at that time.**
36. I am able to sustain attention to a task for over 30 minutes.
37. **I am able to delay rewards over a long period of time.**
38. Even when I am tired I complete the task that is given to me.
39.- I ignore details in the tasks given to me.
40. I am able to begin assigned tasks without prompting.
41. I like my assignments to look neat and tidy.
42. I complete extra credit assignments.
43.- When I work on a group project, I let other people do most of the work.
44. I turn in homework assignments on time.
45.- My parents have to remind me to do my homework.
46. **I volunteer for special jobs at school.**
47. When something interests me, I read all I can about it.
48.- I start projects that I don't finish.
49.- I'd skip classes if I could get away with it.
50. **My friends ask me to help them with their schoolwork.**
51.- I wait until the 'last minute' to do school projects.
52. After class I review my notes to help me to understand the the information.
53. **I do more than the required reading in a course.**
54. I review my notes before the next class.
55.- **I think my studies suffer because I am a poor reader.**
56. I work with a study schedule.
57.- I spend more than four hours each evening relaxing (watching TV etc.).
58.- I read much too slowly to get all my studying done.
59. **I compare class notes with other students to make sure my notes are complete.**
60.- I date on afternoons or evenings after school.
61.- I think I have poor study habits.
62.- I try to study with the radio or television turned on.
63. **I try to translate what I am syudying in my own words.**
64. I participate in extracurricular activities.
65. I am trusted by my teachers.
66. I try to find relationships between what I am studying and what I already know.
67. I follow a routine for waking on mornings and sleeping at nights.
68. **I like to read religious books.**
69.- When I do not complete assignments on time I will copy from a friend.
70.- **I party on weekends.**
71.- I disrupt classes by talking out of turn.
72. I pray before I study.
73. **I have a desk and bookshelf at home for studying.**
74.- I get quite behind in my school work.

75.- I find myself skipping over material to get to the end of an assignment.
76. I like academic challenges.
77.- When work is difficult I either give up or study only the easy parts.
78. I make drawings or sketches to help me to understand what I am studying.
79.- Phone calls disrupt my studies.
80. When they are available, I attend group review sessions.

TABLE 39

POINT-MULTISERIAL CORRELATION COEFFICIENTS OF THE 80-ITEM AND 57-ITEM CLASS VERSIONS OF THE DILIGENCE INVENTORY

Item	Point-multiserial Coefficients 80-item	57-item
1	.5506	.5910
2	**-.0012**	
3	.4955	.5626
4	.5618	.5962
5	.4247	.4747
6	.3668	.4008
7	.3604	.4127
8	.4473	.3840
9	**.1290**	
10	.5588	.5635
11	.4040	.4373
12	.6586	.7061
13	.3623	.4054
14	.2717	.3650
15	.6028	.6661
16	.6134	.6134
17	.4065	.4941
18	.4399	.5561
19	**.2010**	
20	**.1011**	
21	.5710	.5910
22	.4333	.4178
23	**.1956**	
24	.5197	.5139
25	.5113	.5959
26	.4896	.4893
27	.5413	.6005
28	.3846	.4704
29	**.0858**	
30	.1759	
31	.3645	.2393
32	.3322	.3838
33	**.0170**	
34	.3488	.4170
35	**.2313**	
36	.4718	.4493
37	**.2730**	
38	.4494	.3813
39	.3033	.3199
40	.5455	.5599

TABLE 39--Continued

Item	Point-multiserial Coefficients 80-item	57-item
41	.5735	.5860
42	.4435	.3737
43	.5968	.6114
44	.3808	.4052
45	.5355	.5945
46	**.1576**	
47	.4934	.3955
48	.5041	.5236
49	.2906	.3416
50	**.1984**	
51	.5463	.5894
52	.3713	.3178
53	**.0751**	
54	.3824	.3461
55	**.2389**	
56	.3408	.2754
57	.4100	.4765
58	.3390	.3932
59	**-.2130**	
60	.3154	.3785
61	.3823	.3754
62	.4591	.4285
63	**.1376**	
64	.2290	
65	.4052	.3841
66	.4810	.4594
67	.2423	.2870
68	**.1176**	
69	.6277	.6941
70	**.1712**	
71	.3673	.4752
72	.1840	
73	**.1861**	
74	.2259	.2888
75	.5153	.5965
76	.4714	.3831
77	.5790	.6739
78	**-.0031**	
79	**.1120**	
80	.3941	.3411

CONTRIBUTORS TO THE CLASS PROJECT VERSION OF THE DI

Name	Occupation at the time
Hinsdale Bernard	Coordinator, Academic Support and Advising Services and doctoral student: Educational Administration
Leah Carson	Teacher and Ph.D. student: Educational Administration
Ronda Daugherty	M.A. student: Research and Statistical Methodology
Roberta Farwell	Administrative Assiatant, Guidance and doctoral student
Dr. Wilfred Futcher	Chair, Department of Educational and Counseling Psychology and Professor of Research and Statistical Methodology
Kenneth Hanig	Ph.D. student: Educational Psychology
Darlene Hamaan	M.A. student: Community Counseling
David Harwood	Hospital Counselor - Outdoor Treatment
Denise Scameheorn	Director of Employment Services and doctoral student
Terry Shartouni	Doctoral student: Counseling Psychology

APPENDIX D

CONTENT VALIDATION OF THE DI

- Instructions for Judging the Diligence Inventory
- Diligence Inventory
- Comments and Suggestions
- List of Judges of the DI

INSTRUCTIONS FOR JUDGING THE DILIGENCE INVENTORY

POSITION (Circle one): Administrator Counselor Teacher

NAME (Optional) _____

Enclosed are the operational definition for diligence, the definitions of the three broad domains of diligence, and the definitions of the scales that comprise these domains. Bearing in mind that these definitions relate to diligence as applied to education, please follow the procedure outlined below for judging the appropriateness of the domains to diligence, the appropriateness of the scales to each domain, and the appropriateness of the items to each scale.

1. First try to digest the operational definitions before reading the items. Then respond to the following:

2. Do the following domains represent diligence?

		Yes	No
I	INDUSTRY	___	___
II	CITIZENSHIP AND CHARACTER	___	___
III	COGNITIVE SKILLS	___	___

3. Do the following scales represent the respective domains?

		Yes	No
I	INDUSTRY		
	Time management	___	___
	Study skills	___	___
	Organization	___	___
	Motivation	___	___
	Persistence	___	___
II	CITIZENSHIP AND CHARACTER		
	Discipline and Devotion	___	___
	Conformity	___	___
	Integrity	___	___
	Autonomy and Responsiility	___	___
III	COGNITIVE SKILLS		
	Concentration and Attentiveness	___	___
	Literary Skills	___	___
	Information Assimilation and Perspective	___	___

Feel free to make comments in the spaces provided after the definitions.

DILIGENCE INVENTORY

4. Check "yes' (Y) if you think an item belongs to the scale indicated, and "no" (N) if it does not belong. About half of the items are stated **positively** and half **negatively**. Suggestions concerning the wording of any of the items are welcome. Spaces are provided for any additional comments you might have. You are welcome to use the opposite pages for additional space. Remember you are judging the items for appropriateness only, although you may be tempted to respond to them yourself.

INDUSTRY

Y N Time Management

__ __1. I do homework before I spend time with friends.
__ __2. **I play first and do homework after.**
__ __3. If assignments are a little late it is ok.
__ __4. I turn in homework assignments on time.
__ __5. I wait until the "last minute" to do school projects.
__ __6. **I date on afternoons or evenings after school.**
__ __7. I spend more than four hours each evening relaxing (watching television etc.).
__ __8. I socialize with friends on afternoons or evenings after school.
__ __9. **I make good use of my leisure time.**
__ __10. My social life disrupts my studies.

Comments:

Study Skills

__ __1. After class I review my notes to help me to understand the information.
__ __2. I review my notes before the next class.
__ __3. **When they are available, I attend group review sessions.**
__ __4. I take good class notes.
__ __5. My class notes are disorganized.
__ __6. **I think I have poor study habits.**

Comments:

Y N Organzation

__ __1. **My friends see me as very organized.**
__ __2. **(My desk is messy at school).**
__ __3. I like my assignments to look neat and tidy.
__ __4. **(I set goals for myself).**
__ __5. I study where the lighting is good on my eyes.
__ __6. I try to study in a quiet place.
__ __7. **(I like to study in bed).**
Comments:

Motivation

__ __1. **I strive to do the best I can in school.**
__ __2. **I am happy to receive a"C" grade when I could have done "A" work on my assignments.**
__ __3. **I try to do well in all my school subjects.**
__ __4. Some subjects are so difficult they are not worth the effort.
__ __5. My parents help me do my homework.
__ __6. My parents have to urge me to study.
__ __7. I am able to begin assigned tasks without prompting.
__ __8. I complete extra credit assignments.
__ __9. **When I work on a group project, I let other people do most of the work.**
__ __10. My parents have to remind me to do my homework.
__ __11. When something interests me I read all I can about it.
__ __12. **I take up academic challenges.**
__ __13. I'll skip classes if I can get away with it.
__ __14. **(I study on my own).**
__ __15. **I do my assignments promptly.**
__ __16. I do extra reading on my own.
__ __17. **I do a great deal of work to get good grades.**
__ __18. **I am enthusiastic to do my assignments.**
__ __19. I set high standards for myself in school.
Comments:

Y N

Persistence

__ __1. I take a lot of care when I do my assignments.
__ __2. I make sure that my assignments are done correctly.
__ __3. I do not hand in an assignment until I am sure that it is correct.
__ __4. I take care to complete my assignments.
__ __5. I hurry through my work so that I can do other things.
__ __6. When I do something, I do it to the best of my ability.
__ __7. I am persistent.
__ __8. I proofread all assignments before turning them in.
__ __9. Even when I am tired I complete the task that is given to me.
__ __10. I ignore details in the task given to me.
__ __11. I finish projects that I start.
__ __12. I find myself skipping over material to get to the end of my assignment.
__ __13. When work is difficult I either give up or study only the easy parts.
__ __14. I have a tendency to give up rather quickly when I run into a difficult problem.
__ __15. I spend more than 20 hours a week studying.
__ __16. I consider dropping out of school to avoid studying.
__ __17. I can study for more than two hours at at time.

Comments:

CITIZENSHIP AND CHARACTER

Y N

Discipline and Devotion

__ __1. I have a regular exercise program.
__ __2. I get adequate rest.
__ __3. I tend to over eat.
__ __4. I like to have quiet moments for reflection.
__ __5. I follow a routine for waking on mornings and sleeping at nights.
__ __6. I tend to overwork myself.
__ __7. Nature appeals to me.
__ __8. I oversleep during the school week.
__ __9. I keep my weight under control.
__ __10. I drink alcoholic beverages.
__ __11. I attend church or religious services.
__ __12. I drink adequate water.
__ __13. I like to eat junk food.
__ __14. I like to pray.

Comments:

Y N

Conformity

__ __1. I obey my teachers promptly.
__ __2. I have to be disciplined by my teachers.
__ __3. I try to cooperate with my teachers.
__ __4. I obey my parents/guardians promptly.
__ __5. I disrupt classes by talking out of turn.
__ __6. I have to be "grounded" by my parents/guardians.
__ __7. I take advice from my parents/guardians.
__ __8. Teachers have to ask me to be quiet in class.
__ __9. I seek advice from my teachers and counselors.
Comments:

Integrity

__ __1. I am trusted by my teachers.
__ __2. I cheat on asignments or tests and quizzes.
__ __3. When I do not complete my assignments on time, I will copy from a friend.
__ __4. I am trusted by my friends.
Comments:

Autonomy and Responsibility

__ __1. I can be depended on at home.
__ __2. I help to support myself through school.
__ __3. I make my own decisions about dating.
__ __4. I go where I want whenever I want.
__ __5. I enjoy doing extra activities for my school.
__ __6. I do my chores as quickly as possible.
__ __7. I like to lead out in club-related activities.
__ __8. I try to keep within my budget.
__ __9. I participate in extracurricular activities.
__ __10. I inform my parents/guardians as to my whereabouts.
__ __11. If I return from school later than normal I report to my parents/guardians.
Comments:

COGNITIVE SKILLS

Y N

Concentration and Attentiveness

__ __1. **I would rather draw pictures in class than take notes.**
__ __2. **Problems outside of school- being in love, financial difficulties, conflict of parents etc.- cause me to neglect my school work.**
__ __3. I listen to everything the teacher says in class.
__ __4. It is hard for me to concentrate in class.
__ __5. I am easily distracted from whatever I am doing.
__ __6. I am able to sustain attention to a task for over 30 minutes.
__ __7. **I try to study with the radio or television turned on.**
__ __8. My mind wanders a great deal when I study.
__ __9. **(I concentrate fully when I study).**
__ __10. I am distracted from my studies very easily.
__ __11. I find it difficult to concentrate on my school work.
__ __12. **(I don't understand some class work because I don't listen carefully).**
__ __13. I would rather look out the window than pay attention to the teacher.

Comments:

Information Assimilation and Perspective

__ __1. **I am well prepared for tests.**
__ __2. I stop periodically while reading and mentally go over or review what was said.
__ __3. I try to find relationships between what I am learning and what I already know.
__ __4. When I am studying a topic, I try to make everything fit logically.
__ __5. **When preparing for an exam, I create questions that I think might be included.**
__ __6. I do poorly on tests because I find it hard to plan my work within a short period of time.

Comments:

Literary Skills

__ __1. **(I dislike studying in the library).**
__ __2. I am up to date with my reading assignments.
__ __3. I know how to find most things in the library.
__ __4. **(I think my studies suffer because I am a poor reader).**
__ __5. I know enough about the library to use it effectively.
__ __6. **(I read much too slowly to get all my studying done).**
__ __7. I like to use the library.

Comments:

COMMENTS AND SUGGESTIONS

General Comments

- Eliminate repititious items.

Time Management

- Should the average time spent in studying be identified?
- Effort should be made to measure how far in advance a student plans, when faced with the need to finish a major project.
- Setting up a daily schedule?

Study Skills

- Items on how one studies.
- Items on the environment for studying.
- Maybe you could reorganize the positions of the negative and positive items.
- Would you want to include any items here on parental encouragement or one's study environment? For example I find difficulty in studying because of distractions at home, TV, stereo etc.

Organization

- Organization has much to do with planning for an event not as much with the setting in which the planing takes place.
- Having a set time and place.
- Organization of notes (putting the bits and pieces together).

Motivation

- I have tried to see motivation as only the starting point and persistence as the continuation and climax. Another suggestion, if possible and desirable is to link the two scales.

Discipline and Devotion

- This scale may not be appropriate for a public school setting.

Integrity

- Expand this area.
- Items seem to make judgment calls.
- Make separate statements regarding cheating: assignments, quizzes, tests.
- Copying assignments from students.
- Items on returning or witholding a friend's property.

Literary Skills

- I spend all my study time reading novels and my school work suffers.
- Statement on understanding what to read.

LIST OF JUDGES OF THE DI

Name	Occupation at the time
Anonymous	Administrator
Dr. Anonymous	Counselor
Anonymous	Teacher
Robert Crounse	Counselor
William Crow	Counselor
Roberta Farwell	Counselor
Simon Honore	Teacher
David Paulsen	Administrator
Jerry C. Waddington	Teacher
Cleon White	Teacher
Edith Woods	Teacher
Dr. Clinton E. Valley	Superintendent/ Minister

APPENDIX E

ADMINISTRATION OF THE FIRST PILOT STUDY

- Administration of the First Diligence Inventory: Directions for the Proctor
- Diligence Inventory

ADMINISTRATION OF THE DILIGENCE INVENTORY:
DIRECTIONS FOR THE PROCTOR

Following are the steps for administering the diligence inventory for the pilot testing.

A. BEFORE HANDING OUT ANY MATERIAL

(1) Use the report blanks to record the names of the students in a classroom or a particular group, taking note of the number assignments to students.
(2) Assign each student a different number.
(3) Write each number on an answer sheet.

B. THE ADMINISTRATION

(4) Hand out an inventory, and answer sheet to each student in the classroom or group.
(5) Ensure that students have a number 2 pencil with an eraser.
(6) Ask students to read page 1 of the DI and study the answer sheet. Acsertain that the directions are understood.

SAY TO THE STUDENTS

(a) You will now complete the demographic information on page 1 of the DI. Turn to page 1 of the answer sheet.
(b) Do not write your name, leave that entire section blank.
(c) Fill in your date of birth in the appropriate section.
(d) I am going to call the numbers for you to fill in the "IDENTIFICATION NUMBER" section. (A, B&C, D, E). These numbers will refer to County, School, School Type and School Category.
(e) Consult the codes for "Parents' Income" and fill in F.
(f) Consult the codes for "Ethnic" and fill in G.
(g) Leave H, I and J blank.
(h) Fill in your sex.
(i) Fill in your grade.
(j) Now you may begin to respond to the DI. Be careful to match your answers to the questions. Begin on this page and answer the first 60 questions. Then turn to side 2 and answer the other 60 questions.
(i) Now turn in your answer sheet and the DI.

C. AFTER THE ADMINISTRATION

Use the record sheet to record the relevent information for each student as far as possible. Use a paper clip to keep the record sheet for a particular group with the answer sheets after taking these records. Cut off the students' names returning the results to the researcher.

Diligence Inventory
Directions

The purpose of this diligence inventory (DI) is to help in a study that is investigating how students' study habits and associated practices (diligence), relate to academic performance. In order to do this, a number of students will be asked to complete this survey. The scores on the DI will be used together with other measures to see if any pattern develops for all the students taken together. No student's scores will be identifiable.

In this inventory there are 120 statements related to diligence. Please read each statement and on the answer sheet provided, mark the number which is most descriptive of you during the present school year. Use the following key:

0 = RARELY	(0 to 15 per cent of the time).
1 = OCCASIONALLY	(16 to 35 per cent of the time).
2 = SOMETIMES	(36 to 65 per cent of the time).
3 = USUALLY	(66 to 85 per cent of the time).
4 = ALMOST ALWAYS	(86 to 100 per cent of the time).

There are no right or wrong answers. Only be honest with your estimates and go with your first impressions. It is important that you respond to ALL the statements. Your responses will be treated with the strictest confidence. Please DO NOT write your name anywhere on the DI or answer sheet. The researcher will not be able to identify your answers but your candid responses will be very valuable to this study.

Before you begin to answer the inventory your proctor will assist you in completing the following demographic items.

1. Age	4. School type	7. Ethnic
2. County	5. Enrollment category	8. Sex*
3. School	6. Parents' income	9. Grade*

CODES

Age
Give date of birth

County
1 = Berrien
2 = Cassopolis
3 = Kalamazoo
4 = St. Joseph
5 = Van Buren

School Type
1 = Private School
2 = Public School

Enrollment Category
1 = 299 and less
2 = 300 - 499
3 = 500 - 799
4 = 800 and above

School
Your number will be provided.

*Fill appropriate sections on the answer sheet.

Parents' Income
1 = Under 25,000
2 = 25,000-39,999
3 = 40,000-59,999
4 = 60,000 and over

Ethnic
1 = Black --Non Hispanic
2 = Hispanic
3 = Asian/Oriental
4 = White--Non Hispanic
5 = Native American

You are welcome to make comments on this page about the Inventory. Your involvement in completing this DI is greatly appreciated.

0 = RARELY	(0 to 15 per cent of the time).
1 = OCCASIONALLY	(16 to 35 per cent of the time).
2 = SOMETIMES	(36 to 65 per cent of the time).
3 = USUALLY	(66 to 85 per cent of the time).
4 = ALMOST ALWAYS	(86 to 100 per cent of the time).

1. I do homework before I spend time with friends.
2. I have poor study habits.
3. Some subjects are so difficult they are not worth the effort.
4. When something interests me I read all I can about it.
5. I take a lot of care when I do my assignments.
6. I tend to give up quickly when I run into a difficult problem.
7. I have a daily exercise program.
8. Nature appeals to me.
9. I have to be disciplined by my teachers.
10. I can be depended on at home.
11. I like to lead out in club-related activities.
12. My love life interferes with my attention to school.
13. I try to be well prepared for tests.
14. I am up to date with my reading assignments.
15. I play games first and do homework after.
16. I take good class notes.
17. I want to do the best I can in school.
18. During a group project, I let other people do most of the work.
19. I make sure that my assignments are done correctly.
20. Even when I am tired I try to complete my asignments.
21. I get adequate rest every day.
22. Teachers have to ask me to be quiet in class.
23. I enjoy doing extra activities for my school.
24. I am easily distracted from whatever I am doing.
25. My parents help me do my homework.
26. I study where the lighting is good on my eyes.
27. I like to date after school.
28. I strive to do my assignments to the best of my ability.
29. I like to eat junk food.
30. I try to obey my parents/guardians promptly.
31. I participate in extracurricular activities.
32. I am distracted from my studies very easily.
33. I dislike reading assignments.
34. I make constructive use of my leisure time.
35. I like my assignments to look neat and tidy.
36. My parents have to remind me to do my homework.
37. I work very hard to get good grades.
38. I tend to overwork myself.

0 = RARELY	(0 to 15 per cent of the time).
1 = OCCASIONALLY	(16 to 35 per cent of the time).
2 = SOMETIMES	(36 to 65 per cent of the time).
3 = USUALLY	(66 to 85 per cent of the time).
4 = ALMOST ALWAYS	(86 to 100 per cent of the time).

39. I spend more than 20 hours a week studying outside of class.
40. I take advice from my parents/guardians.
41. I cheat on assignments.
42. I make my own decisions about dating (when and where etc.).
43. I listen to everything the teacher says in class.
44. Reading is a boring activity for me.
45. I enjoy attending church or religious services.
46. I tend to skip over material to get to the end of a project.
47. I make use of group review sessions that are available.
48. I spend more than four hours each evening relaxing.
49. I'll skip classes if I can get away with it.
50. Before turning in an assignment I make sure it is correct.
51. I like to have quiet moments for reflection.
52. My mind wanders a great deal when I study.
53. If I return from school later than normal, I will report to my parents/guardians.
54. I know enough about the library to use it effectively.
55. When preparing for an exam, I create questions that I think might be included and study them.
56. I like to socialize with friends after school.
57. I try to study with the television turned on.
58. I am able to begin assigned tasks without prompting.
59. I set high standards for myself in school.
60. I oversleep during the school week.
61. I am persistent when it comes to school work.
62. I like to obey my teachers promptly.
63. I would rather draw irrelevant pictures in class than take lecture notes.
64. When I am studying a topic, I try to make everything fit logically.
65. I know how to find most things in the library.
66. If it is possible I will copy from the teacher's answer key.
67. I keep my weight under control.
68. I seek advice from my teachers and counselors.
69. When school work is difficult I study only the easiest parts.

0 = RARELY	(0 to 15 per cent of the time).
1 = OCCASIONALLY	(16 to 35 per cent of the time).
2 = SOMETIMES	(36 to 65 per cent of the time).
3 = USUALLY	(66 to 85 per cent of the time).
4 = ALMOST ALWAYS	(86 to 100 per cent of the time).

70. My friends see me as very organized for school.
71. I help to support myself through school.
72. I find it difficult to concentrate on my school work.
73. I like to use the library.
74. I do poorly on tests because I find it hard to plan my work within a short period of time.
75. I do my assignments as soon as I get them.
76. I try to study in a quiet place.
77. My social life disrupts my studies.
78. I am trusted by my teachers.
79. I would rather look out the window than pay attention to the teacher.
80. I drink adequate water every day.
81. I turn in homework assignments on time.
82. I proofread all assignments before turning them in.
83. I tend to over eat.
84. I do my chores as quickly and thoroughly as possible.
85. I am able to sustain attention to a task for over 30 minutes.
86. I like to take up academic challenges.
87. I wait until the "last minute" to do school projects.
88. I can study for more than two hours at a time.
89. I have to be disciplined by my parents/guardians.
90. It is hard for me to concentrate in class.
91. My class notes are disorganized.
92. I complete extra credit assignments.
93. I try to do outstanding work in all my classes.
94. I ignore details in assignments given to me.
95. I try to cooperate with my teachers.
96. I inform my parents/guardians as to my whereabouts.
97. I cheat on quizzes and tests if it is possible.
98. I try to find relationships between what I am learning and what I already know.
99. I hurry through my school work so that I can do other things.
100. I follow a routine for waking and going to bed.
101. I am satisfied with a "C" grade, even though I could do "A" work on my assignments.
102. I am trusted by my friends.
103. I take care to complete my assignments.
104. I drink alcoholic beverages.

0 = RARELY (0 to 15 per cent of the time).
1 = OCCASIONALLY (16 to 35 per cent of the time).
2 = SOMETIMES (36 to 65 per cent of the time).
3 = USUALLY (66 to 85 per cent of the time).
4 = ALMOST ALWAYS (86 to 100 per cent of the time).

105. I try to study with the radio turned on.
106. I do extra reading on my own.
107. I like to read materials outside of school work.
108. I am enthusiastic about doing my assignments.
109. I disrupt classes by talking out of turn.
110. If I do not complete an assignment, I will copy from a friend.
111. I read so that I could understand the subject matter.
112. I finish projects that I start.
113. I like to pray every day.
114. My parents have to urge me to study.
115. I go where I want, whenever I want.
116. I stop periodically while reading and mentally go over or review what was said.
117. I have considered dropping out of school to avoid studying.
118. I try to keep within my budget.
119. I review my notes before the next class.
120. If assignments are a little late it is ok.

APPENDIX F

DILIGENCE INVENTORY FOR THE SECOND PILOT STUDY

DILIGENCE INVENTORY

DIRECTIONS

The purpose of this diligence inventory (DI) is to help in a study that is investigating how students' study habits and associated practices (diligence), relate to academic performance. In order to do this, a number of students will be asked to ccomplete this survey. The scores on the DI will be used together with other measures to see if any pattern develops for all the students taken together. No student's scores will be identifiable.

In this inventory there are 55 statements related to diligence. Please read each statement and circle the number which is most descriptive of you during the present school year. Use the following key:

0 = NEVER/RARELY	(0 to 15 percent of the time)
1 = OCCASIONALLY	(16 to 35 percent of the time)
2 = SOMETIMES	(36 to 65 percent of the time)
3 = USUALLY	(66 to 85 percent of the time)
4 = ALMOST ALWAYS	(86 to 100 percent of the time)

There are no right or wrong answers. Only be honest with your estimates and go with your first impressions. It is important that you respond to ALL the statements. Your responses will be treated with the strictest confidence. Please DO NOT write your name anywhere on the this inventory. The researcher will not be able to identify your answers but your candid responses will be very valuable to this study.

Before you begin to answer the inventory please respond to Section A.

DEVELOPED BY HINSDALE BERNARD
ANDREWS UNIVERSITY, BERRIEN SPRINGS, MI 49104

Section A

Please circle the appropriate responses:

1. **My present age:**
   1 = under 16 years 6 months
   2 = Between 16 years 6 months and 18 years
   3 = Over 18 years

2. **Gender**
   1 = Male
   2 = Female

3. **Grade**
   1 = Eleventh
   2 = Twelfth

4. **Income level of parent(s)**
   1 = Under $25,000
   2 = $25,000-39,999
   3 = $40,000-59,999
   4 = $60,000 and over

5. **Ethnic Background**
   1 = Black--Non Hispanic
   2 = Hispaic
   3 = Asian/Oriental
   4 = White--Non Hispanic
   5 = Native American

Section B

Please circle the number which is most descriptive of you during the present school year.

0 = never/; 1 = occasionally; 2 = sometimes; 3 = usually; 4 = almost always rarely

1.	I want to do the best I can in school.	0	1	2	3	4
2.	I make constructive use of my leisure time.	0	1	2	3	4
3.	I listen to every thing the teacher says in class.	0	1	2	3	4
4.	I wish I don't have to do chores at home.	0	1	2	3	4
5.	I take care to complete my assignments.	0	1	2	3	4
6.	I feel I am not getting enough rest.	0	1	2	3	4
7.	I am able to do my assignments without prompting.	0	1	2	3	4
8.	I have problems with taking class notes.	0	1	2	3	4
9.	I stop periodically while reading and review the information.	0	1	2	3	4
10.	I take more advice from friends than my parents/ guardians.	0	1	2	3	4
11.	I proofread assignments before turning them in.	0	1	2	3	4
12.	I take time to admire things of nature.	0	1	2	3	4
13	I avoid extra credit assignments because they take too much time.	0	1	2	3	4

0 = never/; 1 = occasionally; 2 = sometimes; 3 = usually; 4 = almost always rarely

14.	I review my notes before the next class.	0	1	2	3	4
15.	When I am studying a topic, I try to make all the ideas fit logically.	0	1	2	3	4
16.	I don't care to participate in extracurricular activities.	0	1	2	3	4
17.	I make sure that my asignments are done correctly.	0	1	2	3	4
18.	I follow an exercise routine to keep me mentally alert.	0	1	2	3	4
19.	I like to take up academic challenges.	0	1	2	3	4
20.	I like to relax with friends before I do my homework.	0	1	2	3	4
21.	When preparing for an exam, I create questions that I think might be included and study them.	0	1	2	3	4
22.	I don't think it's necessary to inform my parents/ guardians as to my whereabouts.	0	1	2	3	4
23.	I strive to do my assignments to the best of my ability.	0	1	2	3	4
24.	I have irregular eating habits.	0	1	2	3	4
25.	I set high standards for myself in school.	0	1	2	3	4
26.	I like my assignments to iook neat and tidy.	0	1	2	3	4
27.	I try to see the relationships between what I'm studying and what I already know.	0	1	2	3	4
28.	It is not easy for me to cooperate with all my teachers.	0	1	2	3	4
29.	I do not turn in an assignment until I'm sure that it is correct.	0	1	2	3	4
30.	I forget to drink adequate water.	0	1	2	3	4
31.	I get upset over the amount of school work I have to do.	0	1	2	3	4
32.	My friends see me as very organized for school.	0	1	2	3	4
33.	I find myself not prepared for tests as I would like.	0	1	2	3	4
34.	I seek advice from my teachers and counselors.	0	1	2	3	4
35.	I start projects well, but I have problems with completing them.	0	1	2	3	4
36.	I like to pray every day.	0	1	2	3	4
37.	I don't care for my parents to interfere in my school work.	0	1	2	3	4
38.	I do my assignments as soon as I get them.	0	1	2	3	4
39.	If I return from school later than normal I would offer an explanation to my parents/guardians.	0	1	2	3	4
40.	I find it difficult to complete all my assignments.	0	1	2	3	4
41.	I enjoy attending church or religious services.	0	1	2	3	4
42.	When a subject is too difficult I settle for a passing grade.	0	1	2	3	4
43.	I try to turn in my homework assignments on time.	0	1	2	3	4
44.	I like to obey my teachers promptly.	0	1	2	3	4

(Please Turn Over)

0 = never/; 1 = occasionally; 2 = sometimes; 3 = usually; 4 = almost always
rarely

45.	I try to keep my weight under control.	0	1	2	3	4
46.	Even when I'm tired I try to complete my assignments.	0	1	2	3	4
47.	I try to keep within my budget.	0	1	2	3	4
48.	I find it difficult to sustain attention to my school work.	0	1	2	3	4
49.	I try to do outstanding work in all my classes.	0	1	2	3	4
50.	I obey my parents/guardians promptly.	0	1	2	3	4
51.	I tend to fall asleep when I'm studying.	0	1	2	3	4
52.	I help to support myself through school.	0	1	2	3	4
53.	I have difficulty in settling down to my studies at home.	0	1	2	3	4
54.	I like to have quiet moments for reflection.	0	1	2	3	4
55.	I work very hard to get good grades.	0	1	2	3	4

APPENDIX G

DILIGENCE INVENTORY FOR THE ACTUAL STUDY

- Directions for the Proctor
- Diligence Inventory

DIRECTIONS FOR THE PROCTOR

The completion of the DI by the students is going to be a relatively straightfoward step, requiring about 15 minutes. But before this is done, the DIs need to be coded to facilitate the recording of infomation about students on the SPMS, so that there is a match between DI and SPMS for each student.

In order to simplify this step and ensure anonymity, it is recommended that the students in a particular class be used as a group. In this way, ID numbers may be easily assigned based on the attendance register. An additional code may be used with each number to distinguish one class from another in a particular school. This coding system will also be the basis for providing the results on the DI.

The SPMS shows the information that is needed. A possible sequence for the process is as follows:

1. Assign student IDs on the SPMS. Names may be recorded to facilitate referencing.
2. Code the Diligence Inventories with these IDs.
3. Distribute the DIs based on these codes.
4. Record the students' performance measures on the SPMS, as records permit.

If records are not available in certain categories for a student, those records may be left blank but the student's completed DI should still be turned in for the validation part of the study. As such, at least the DIS column may be filled for each student. If tabulating all the information requested on the SPMS is too time consuming for all the students in a class, a sample of about half the students is quite acceptable. Please leave the ACT column blank for all students. Any conversions will be done subsequently.

I hope that things work smoothly. Thanks for your help with this study. If there are further questions, please feel free to call Hinsdale Bernard at 471-7274.

DILIGENCE INVENTORY

DIRECTIONS

The purpose of this diligence inventory (DI) is to help in a study that is investigating how students' study habits and associated practices (diligence), relate to academic performance. In order to do this, a number of students will be asked to complete this inventory. The scores on the DI will be used together with other measures to see if any trend develops for all the students taken together. No student's scores will be identifiable.

In this inventory there are 55 statements related to diligence. Please read each statement and circle the number which is most descriptive of you during the present school year. Use the following key:

1 = NEVER/RARELY	(0 to 15 percent of the time)
2 = OCCASIONALLY	(16 to 35 percent of the time)
3 = SOMETIMES	(36 to 65 percent of the time)
4 = USUALLY	(66 to 85 percent of the time)
5 = ALMOST ALWAYS	(86 to 100 percent of the time)

There are no right or wrong answers. Only be honest with your estimates and follow your first impressions. It is important that you respond to ALL the statements. Your responses will be treated with the strictest confidence. Please DO NOT write your name anywhere on this inventory. The researcher will not be able to identify your answers but your candid responses will be very valuable to this study.

Before you begin to answer the inventory please respond to Section A.

DEVELOPED BY HINSDALE BERNARD
ANDREWS UNIVERSITY, BERRIEN SPRINGS, MI 49104

Section A

Please write in your answer to item 1 and circle the appropriate responses for items 2 to 5.:

1. **My present age in years and months:**
   _____ Years _____ Months

2. **Gender**
   1 = Female
   2 = Male

3. **Grade**
   11 = Eleven
   12 = Twelve

4. **Income level of parent(s)**
   1 = Under $25,000
   2 = $25,000-39,999
   3 = $40,000-59,999
   4 = $60,000 and over

5. **Ethnic Background**
   1 = Asian/Oriental
   2 = Black--Non Hispanic
   3 = Hispanic
   4 = Native American
   5 = White--Non Hispanic

Section B

Please circle the number which is most descriptive of you during the present school year.

1 = NEVER/RARELY	(0 to 15 percent of the time)
2 = OCCASIONALLY	(16 to 35 percent of the time)
3 = SOMETIMES	(36 to 65 percent of the time)
4 = USUALLY	(66 to 85 percent of the time)
5 = ALMOST ALWAYS	(86 to 100 percent of the time)

1.	I want to do the best I can in school.	1	2	3	4	5
2.	I make constructive use of my leisure time.	1	2	3	4	5
3.	I listen to every thing the teacher says in class.	1	2	3	4	5
4.	I wish I don't have to do chores at home.	1	2	3	4	5
5.	I take care to complete my assignments.	1	2	3	4	5
6.	I feel I am not getting enough rest.	1	2	3	4	5
7.	I am able to do my assignments without prompting.	1	2	3	4	5
8.	I have problems with taking organized class notes.	1	2	3	4	5
9.	I stop periodically while reading and review the information.	1	2	3	4	5
10.	I take more advice from friends than from my parents/guardians.	1	2	3	4	5
11.	I proofread assignments before turning them in.	1	2	3	4	5
12.	I take time to admire things of nature.	1	2	3	4	5
13	I do not find time to do extra credit assignments.	1	2	3	4	5
14.	I review my notes before the next class.	1	2	3	4	5
15.	When I am studying a topic, I try to make all the ideas fit logically.	1	2	3	4	5
16.	I like to participate in extracurricular activities for my school.	1	2	3	4	5
17.	I make sure that my assignments are done correctly.	1	2	3	4	5

18.	I think I don't get enough exercise.	1 2 3 4 5
19.	I like to take up academic challenges.	1 2 3 4 5
20.	I do homework before I spend time with friends.	1 2 3 4 5
21.	When preparing for an exam, I create questions that I think might be included and study them.	1 2 3 4 5
22.	I don't think it's necessary to inform my parents/guardians as to my whereabouts.	1 2 3 4 5
23.	I strive to do my assignments to the best of my ability.	1 2 3 4 5
24.	I have irregular eating habits.	1 2 3 4 5
25.	I set high standards for myself in school.	1 2 3 4 5
26.	I like my assignments to look neat and tidy.	1 2 3 4 5
27.	I try to see the relationships between what I'm studying and what I already know.	1 2 3 4 5
28.	Some teachers think I give them a hard time.	1 2 3 4 5
29.	I do not turn in an assignment until I'm sure that it is correct.	1 2 3 4 5
30.	I forget to drink adequate water.	1 2 3 4 5
31.	I get upset over the amount of school work I have to do.	1 2 3 4 5
32.	My friends see me as very organized for school.	1 2 3 4 5
33.	I find myself not prepared for tests as I would like.	1 2 3 4 5
34.	I seek feedback from my teachers and/or counselors concering the progress I am making in school.	1 2 3 4 5
35.	I start projects well, but I have problems with completing them.	1 2 3 4 5
36.	Personally, I like to take a little time out to pray or meditate.	1 2 3 4 5
37.	I don't like my parents to interfere in my school work.	1 2 3 4 5
38.	I do my assignments as soon as I get them.	1 2 3 4 5
39.	If I return from school later than normal I would offer an explanation to my parents/guardians.	1 2 3 4 5
40.	I find it difficult to complete all my assignments.	1 2 3 4 5
41.	I enjoy attending church or religious services.	1 2 3 4 5
42.	When a subject is too difficult I settle for a passing grade.	1 2 3 4 5
43.	I try to turn in my homework assignments on time.	1 2 3 4 5
44.	I like to obey my teachers promptly.	1 2 3 4 5
45.	I try to keep my weight under control.	1 2 3 4 5
46.	Even when I'm tired I try to complete my assignments.	1 2 3 4 5
47.	I try to keep within my budget.	1 2 3 4 5
48.	I find it difficult to sustain attention to my school work.	1 2 3 4 5
49.	I try to do outstanding work in all my classes.	1 2 3 4 5
50.	I obey my parents/guardians promptly.	1 2 3 4 5
51.	I tend to fall asleep when I'm studying.	1 2 3 4 5
52.	I help to support myself through school.	1 2 3 4 5
53.	I have difficulty in settling down to my studies at home.	1 2 3 4 5
54.	I like to have quiet moments to plan my strategies for success in school.	1 2 3 4 5
55.	I work very hard to get good grades.	1 2 3 4 5

APPENDIX H

STUDENT PERFORMANCE MEASURES SHEET SHOWING PART OF THE RESULTS FROM ONE SCHOOL

STUDENT PERFORMANCE MEASURES SHEET
(SPMS)
Please see reverse side for explanations

NAME	ID	SCORE	PR	YEAR	ACT	SGPA	CGPA	DIS

LEGEND AND EXPLANATIONS
FOR THE STUDENT PERFORMANCE MEASURES SHEET
(SPMS)

NAME — The student's name facilitates matching the DI with the student's performance scores. Please keep this sheet for your records and send a copy **without names** to the researcher.

ID — Student identification number. Any convenient system can be used. The only stipulation is that the performance measures for a student and the DI for that student should have the same ID. Juniors and seniors should be numbered separately.

SCORE — **ACT, PSAT** or **SAT Total** score. Please indicate which test a student took with an **A, P** or **S** respectively.

PR — Corresponding percentile rank on the ACT, PSAT or SAT.

YEAR — The year a student took the standardized test.

ACT — ACT Equivqlent of the PSAT or SAT. Please ignore this column if these conversions are not available.

SGPA — Student's GPA (on a scale A = 4.00) for the **first** semester of the 1989 - 1990 school year.

CGPA — Student's cummulative GPA over the period of attendance in the high school.

DIS — A **subjective** evaluation of the student's diligence by a teacher. This estimation should reflect on **diligence** (suggested by the items on the DI) and not on a student's ability or GPA. The following scale can be used:

1 = low diligence (bottom 25% of students).
2 = average diligence (middle 50% of students).
3 = high diligence (top 25% of students).

STUDENT PERFORMANCE MEASURES SHEET
(SPMS)
Please see reverse side for explanations

NAME	ID	SCORE	PR	YEAR April	ACT	SGPA	CGPA	DIS
0111		A 24	89	1990		3.714	3.613	3
0211		A 21	78	1990		3.428	3.455	3
0311		A 20	73	1990		3.333	3.636	3
0411		A 24	89	1990		3.333	3.400	2
0511		A 24	89	1990		3.714	3.647	3
0611		A 21	78	1990		3.285	3.182	2
0711		A 21	78	1990		3.166	3.483	3
0811		A 24	89	1990		3.500	3.400	2
0911		A 22	83	1990		3.428	3.571	3
1011		A 24	89	1990		3.142	3.229	2
1111		A 22	89	1990		2.833	3.133	2
1211		A 21	78	1990		3.571	3.514	3
1311		A 26	95	1990		3.666	3.667	3
1411		A 22	83	1990		3.166	3.233	2
1511		A 32	99	1990		4.00	3.967	3

APPENDIX I

ACT CORRESPONDENCE AND CONCORDANCE TABLES

- ACT Equipercentile Concordance Table: Enhanced ACT Assessment Composite Score to former ACT Assessment Composite Score
- ACT Composite Score Equivalents of SAT Total Score

ACT

May 1, 1990

Hinsdale Bernard
4834-1 Dogwood Drive
Berrien Spring MI

Dear Mr. Bernard:

Thank you for your inquiry about converting ACT and SAT scores. The problems associated with converting ACT and SAT scores were described in a speech by E. F. Lindquist, "Equating Scores on Non-Parallel Tests", which I am enclosing.

The fundamental problem Lindquist identified is that the two test batteries measure different psychological constructs. The ACT Assessment tests are achievement oriented; their content is intended to be representative of knowledge and skills that are taught in the typical high school curriculum and that are considered essential for success in college. The SAT, in contrast, measures theoretically defined educational aptitudes. Because of these differences in content, there can be different definitions of equivalent performance on the two tests.

Several postsecondary institutions and state educational agencies have developed concordance tables from statistical relationships observed between the two tests. These tables do not yield the same results. One reason for this may be that different groups of students have had different educational experiences with respect to the constructs being measured. I am enclosing a set of tables developed in 1987 by the University of Illinois. When using them, you should keep in mind that other tables might yield different results.

In most concordance tables, comparable scores are taken to be those having the same percentile with respect to each test. Such "equipercentile" tables are most useful for determining the test score selection level on one test that results in approximately the same proportion of students selected by the other test. Equipercentile concordance tables may, however, result in inaccurate score estimates for individuals. Such tables should therefore be used with caution when trying to predict an individual's score on one test from his or her score on the other.

From a methodological standpoint, it is preferable to use ACT scores and SAT scores separately. Many institutions can not develop or maintain separate systems, however; they choose instead to convert scores using concordance tables, though the tables are subject to error.

2201 North Dodge Street, P.O. Box 168
Iowa City, Iowa 52243
(319) 337-1000

You may be aware that we have recently made major changes in the ACT Assessment. The first administration of the Enhanced ACT Assessment was in October, 1989. As a result, institutions will be admitting students in 1990 with scores from the former ACT Assessment or from the Enhanced ACT Assessment. By 1991, most students will be admitted with scores from the Enhanced ACT Assessment. I have enclosed a booklet containing tables for converting former ACT scores to Enhanced ACT scores. These tables can help you in making admissions and placement decisions during this transition period. I have also included a booklet describing the content of the Enhanced ACT Assessment.

ACT/SAT concordance tables developed for the former ACT Assessment can not be used directly for students tested after October, 1989. Because the Enhanced ACT Assessment is a new test battery, former ACT and Enhanced ACT scores have different meanings, even though the score scale range is still 1 to 36. We are planning a study to examine the association between Enhanced ACT scores and SAT scores. The results will be available in the fall of 1990.

Some institutions may choose to use the former ACT/Enhanced ACT concordance tables in combination with the ACT/SAT concordance tables to facilitate making admissions decisions in 1989-90. Using the tables in this manner, however, will increase the likelihood of error. As I explained earlier, score conversions reported in any concordance table inevitably contain error; this error will be compounded if you do multiple conversions (e.g., SAT score to former ACT score to Enhanced ACT score). We therefore recommend caution if you use converted scores obtained this way.

Thank you again for your inquiry. Please let me know if I can be of further assistance.

Sincerely,

Michael Hendryx, Ph.D.
Research Associate
Research and Statistical Services
Research Division

MH:ddm

Enclosures

cc: ACT Regional Office

TABLE 40

**ACT EQUIPERCENTILE CONCORDANCE TABLE:
ENHANCED ACT ASSESSMENT COMPOSITE SCORE
TO FORMER ACT ASSESSMENT COMPOSITE SCORE**

Composite score on Enhanced ACT Asessment	Concordant score for Former ACT Composite score
1	1
2	1
3	1
4	2
5	2
6	3
7	3
8	4
9	4
10	5
11	6
12	7
13	8
14	9
15	11
16	12
17	14
18	15
19	17
20	18
21	19
22	21
23	22
24	23
25	24
26	25
27	26
28	27
29	28
30	29
31	30
32	31
33	32
34	33
35	34
36	35

TABLE 41

ACT COMPOSITE SCORE EQUIVALENTS OF SAT TOTAL SCORE

ACT: Composite	SAT: Total
7	470-480
8	490
9	500-540
10	550-560
11	570-580
12	590-620
13	630-650
14	660-680
15	690-710
16	720-740
17	750-770
18	780-800
19	810-830
20	840-860
21	870-890
22	900-920
23	930-960
24	970-1000
25	1010-1040
26	1050-1080
27	1090-1130
28	1140-1170
29	1180-1220
30	1230-1280
31	1290-1330
32	1340-1390
33	1400-1470
34	1480-1540
35	1550-1600

APPENDIX J

DATA SET FOR THE STUDY

001 522118.9221215343334321422213343321331233325 2313131432443522324243 23 2.9402.9503
002 522118.0811235533532421332123343321335343535323333114135351132331314163.0093.1001
003 5221 21225554343443544444414232324343324333235433225544345354243 2.6702.6702
004 522117.4211215222223242114412 2111121313331141113343333543514513553112 13.8493.8502
005 522118.2511215522535321533335445434555443125455421214523531454435332 4 1.2901.2501
006 522118.4211213534344333243243341312453444141331332131332453313344454 4 2.9102.8901
007 522117.9211225543454424345235345432343455223142442323522535543323442523 3.8073.8043
008 522118042212 533212531341531431111132525332513512452532441534513331 42 3.0402.0503
009 522117.9221225442145315325215143 4 24453431315113352422135453324 41 223163.7703.7803
010 522118.0821225425544321345445413311344441213335321341215331334534335 1.6761.6782
012 522118.5811215443245312535213543321342342132133523545345555542443541 5 2.7603.7403
013 522117.5821223533543413352344541323333344433322211122233344423334442 2 2.0002.2501
014 522117.83112 553355434223533343443213555532323333353513153435443355151 93.5643.6441
015 522117.8311235435145312543145424132454441435445421241313544344442254233.3453.4003
016 522118.0021235434545314322222543432424442242222321324211531411544422 5 1.7501.9303
021 522118.4211235333243322134223442233245443132233315333254544442342533 3 1.8701.0701
022 522119.4221225353342332124422322334332235433223243222523333343444233193.2503.2523
023 522117.7511125543444332233343433332445341334343353353535534433432334 1.9001.7603
024 522118.25211 524353532153533343134413133313231313343341334533323233 3 2.4353.4103
025 522118.1711125435521343333333435433345333135333333331153552332353533232.6002.4202
026 522117.8311115344532323413323333223433234123343224332312553433332232 3 2.4302.4002
027 522116.7511115333254215544141431111455433113454415351155442542254434092.0002.1002
028 522116.9221135444443423323234332322142434423223343324233243323342 2434 2.9002.7302
029 522117.4211125544253413242333343444153553144242325145251554543451523514 2.3002.2702
030 5221 111253334531323323443323241344332323253331353325454533533333283.2103.0802
032 522117.4211125434345452345125543532243435342334542533241553422541234 5233.0002.9902
034 522118.4211115342331524215344533213225353131515554343434321 342242324112.1502.2302
035 5221 111135352413322431341532453211541324552321331223453423423453 2.6302.5702
036 522116.9511125533332334333323333423144334231224334134435343425334334222.5002.5201
037 522117.3321115433233424323222443433332333431333432342211444434343343 3 1.8001.0401
038 522117.3311113542234554223423125331135555135251112145213455551553445320 2.9402.9602
039 522117.1711115545541454555145545451153554155 14 535515555555555455555420 2.6702.8002
040 522117.0021125554151415322323435144515155525113111255513555555515511155 2.1002.2602
041 5221 211154335454454243343343133433233334233424314254233443243533263.4903.6103
042 522116.9211125533232431112 335332325434421313231421123455555541452331 5 2.8102.2502
043 522116.8311115432351554323335143445152544132244353245135555452331531516 2.7702.9102
044 5221 211355544454234555445353554545343445542545553454343455455514 2.6302.7403
045 522116.8321115353331251325324233323335334512432225331353335345332242215 2.5102.4802
046 522116.50111 353415442432343143231345553133224334352121544422433141415 2.5602.6702
047 522117.5811125524143514354424454532245555135131415215241455332441535522 3.8603.9502
048 522118.5811135533445313533333543113132453115322321232133345421 4 15334 2.2102.0102
049 522116.6721115533534321112253534331534333232325251424415455354253413173.8003.8202
050 522116.0021125533335312433315531323231344533 3 33233333335312 44332333243.8903.8702
051 522117.3711123533535412354524225312145443115215131235222555223352152 3 1.6201.9302
052 522117.6711125544343334223234433343142343132222222234324443343343132 5 1.5101.6702
053 522118.5021113555152555134433133553354515132212332545255533351552523 5 3.8703.9102
054 522116.5811125544344423344224454333143454141344443144333455343552433 4 2
0111 321217.4211145444343423444335353445352545131344323344334443441435424 3.7143.6133
0211 321217.2511124545353513245145541453151554133351112155315551552553123521 3.4283.4553
0311 321216.9221145553535341242542453541234253121121332154511154534243113152 03.3333.6363
0411 321216.9221145554342512235345551334152443231342531445112531442551323524 3.3333.4002
0511 321217.0811125544142513425135551554151554141141512155151555551441515524 3.7143.6473
0611 321217.4211125534253514155515513451414551533534215452525555551352525321 3.2853.1822
0711 321217.00 111555455251334524524545152545131342323155342545553553522521 3.1663.4833
0811 321216.0011125544255413313525451343141545141333311444211554452542134424 3.5003.4002
0911 321217.3311125554353421232345423422435421213332323451435444424411315223.4283.5713
1011 321217.2521125253333523134215552123223425143215135123333551555333355324 3.1423.2282
1111 321217.2521135533243312215414541322441434341322211344313545453441131422 2.8333.1332
1211 321216.75 112553545242132411545322415345424133243235241553453453233421 3.5713.5143
1311 321216.8311125533454314223234542435144533225341325155151535444451432526 3.6663.6673
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VITA

Name: Hinsdale Bernard

Date of Birth: May 30, 1946
Place of Birth: Trinidad, West Indies

Undergraduate and Graduate Schools Attended:

University of the West Indies, Trinidad
College of the Virgin Islands, St. Croix Campus
Andrews University, Berrien Springs, Michigan

Degrees Awarded:

Bachelor of Science, University of the West Indies, 1972
Diploma in Education, University of the West Indies, 1979
Master of Arts, College of the Virgin Islands, 1984
Doctor of Philosophy, Andrews University, 1991

Experience:

Secondary School Teacher, Trinidad and St. Croix, U. S. Virgin Islands, 1965-1968 and 1972-1984

Secondary School Science Chair, Trinidad and St. Croix, U. S. Virgin Islands, 1976-1984

Substitute Teacher and Adult Education Instructor, Benton Harbor, Michigan, 1985-1987

Graduate Assistant, Andrews University, 1984-1988

- Scholastic Study Laboratory, 1984-1986
- Center for Research and Statistical Services, 1986-1987
- Office of Institutional Research, 1987-1988

Supervisor, Academic Skills and Advising, Andrews University, 1988-1989

Research Assistant, Center for Statistical Services, Andrews University, 1989-1990